

MINING WORLD

IRON
ORE
OUTLOOK

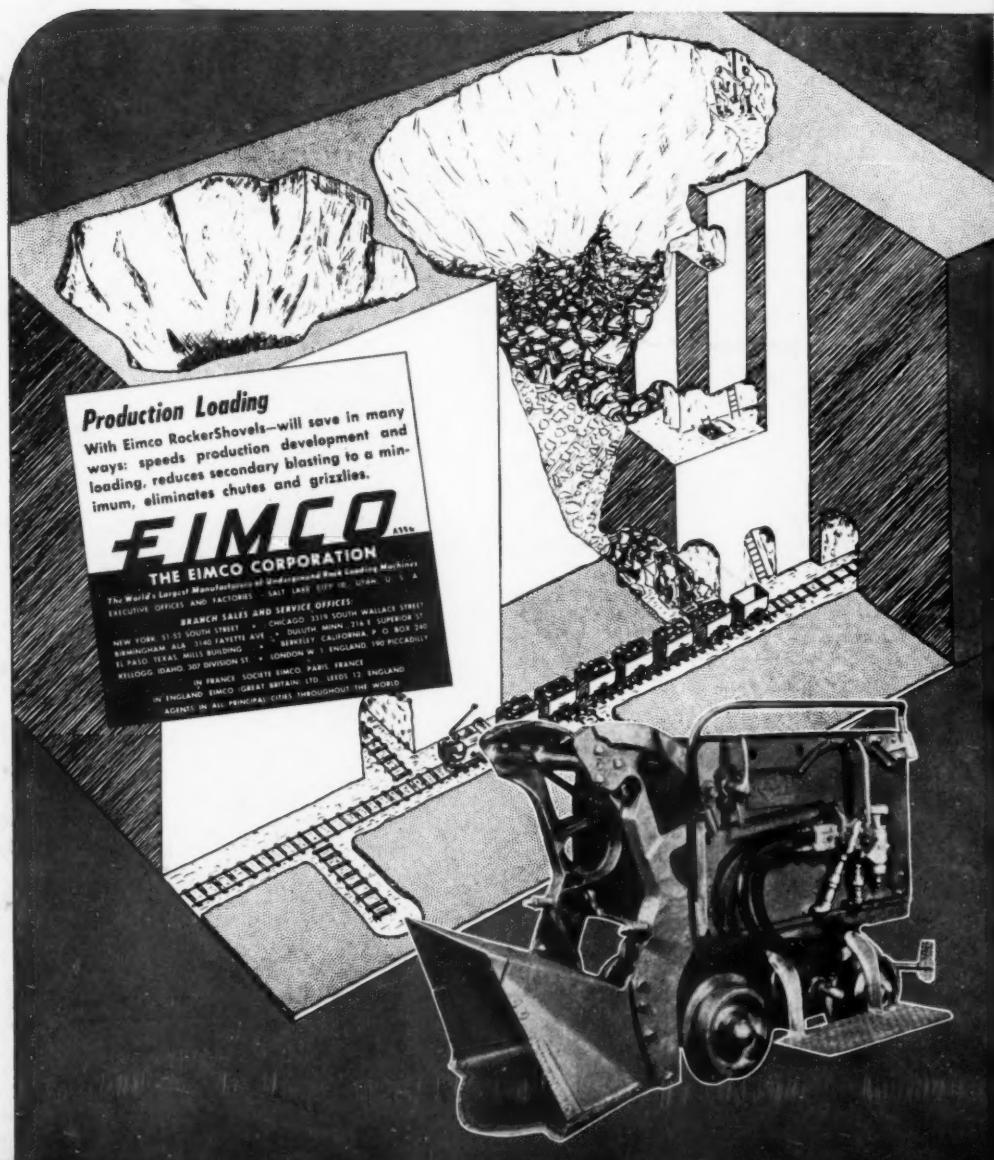
WANTED IN 1953:
144,000,000 Gross Tons
of Iron Ore

OCTOBER, 1951

Vol. 13

No. 11

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HELP YOURSELF TO

STAYING

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A "Caterpillar" Diesel D13000 Engine powers the 11½-cu.-yd. Link-Belt Speeder shovel, loading iron ore into a "Cat" No. 80 Scraper pulled by a "Cat" D8 Tractor. The unit is owned by The Hodge Mining Company and is being operated in their open pit near Canton, Ga. Owner John W. Hodge says: "They're light on repairs, easy to handle and easy on fuel and oil."

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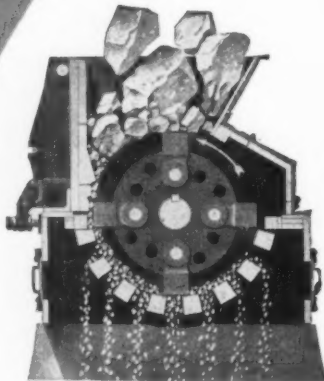
JEFFREY Equipment for

MATERIAL HANDLING



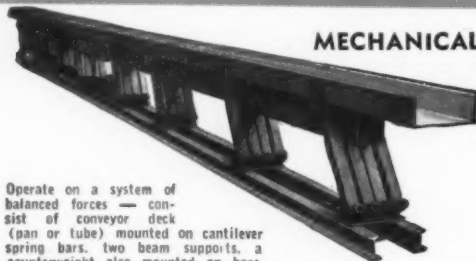
GRIZZLY FEEDERS

Provide feeder and non-clogging grizzly in single unit. Save headroom and eliminate troublesome gates on coarse material. Shown is a Jeffrey-Traylor Grizzly Feeder with 5' wide and 8' long deck—a No. 5 multi-power unit.



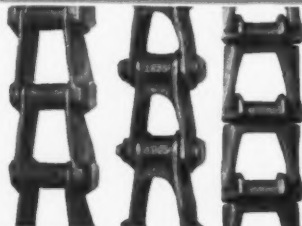
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A complete line . . . a type and size for most any reduction requirement. Single, Double Roll, FLEXTOTH, and Mud Hog Crushers; Rigid and Swing Hammer Pulverizers; Rock Busters, etc. Catalog No. 837 describes and pictures the entire line.



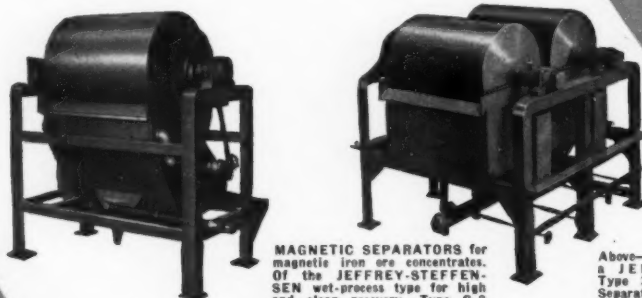
MECHANICAL VIBRATING CONVEYORS

Operate on a system of balanced forces—consist of conveyor deck (pan or tube) mounted on cantilever spring bars, two beam supports, a counterweight also mounted on bars, and the drive. Handle abrasive, lumpy or rough materials, hot or cold, dry or wet—also finer and softer materials.



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MAGNETIC SEPARATORS for magnetic iron ore concentrates. Of the JEFFREY-STEFFENSEN wet-process type for high and clean recovery. Type C-2 wet type Magnetic Cobber (left)

Above—a JEFFREY-STEFFENSEN Type 3040 two-drum Magnetic Separator. Also three-drum types.

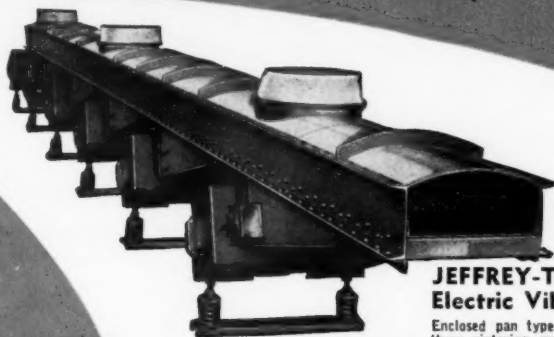
Here is a brief review of the many units bearing the Jeffrey trade mark and applicable to metal mine operations. There is equipment for material handling, processing, reducing, separating and ventilating . . . to help you do a better job at minimum cost.

Jeffrey has a wide experience in designing and building mining equipment—both coal and metal—to meet the operator's needs. We also offer the advantages of complete Engineering and Manufacturing facilities to help you meet today's processing requirements. Consult a Jeffrey Engineer on the right type and size unit to meet your specific need.

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Modern Metal Mine Operation



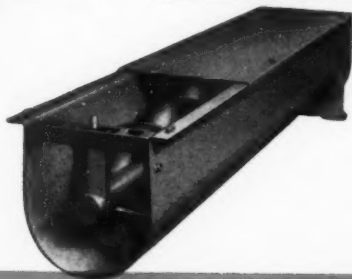
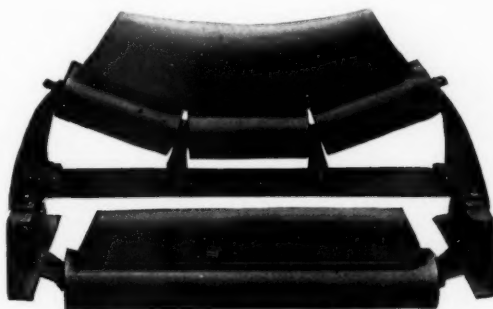
JEFFREY-TRAYLOR Electric Vibrating Conveyor

Enclosed pan type for handling hot return sinter fines. Unit shown serves three sintering machines. Deck is 25" wide x 45' long—has three feed inlets. Also Feeders, Screens and Weigh-Feeders.

PROCESSING VENTILATING

BELT CONVEYORS

Furnished in troughing and flat belt types in widths from 14" to 60". A complete line of Idlers for use with Belt Conveyors for moving large tonnages over great distances. Standard type troughing with standard return idler is shown. Also Impact Absorption Idlers with rubber rolls; Self-aligning troughing and return idlers; Rubber-covered Spool return idlers, etc. Send for Catalog No. 785.

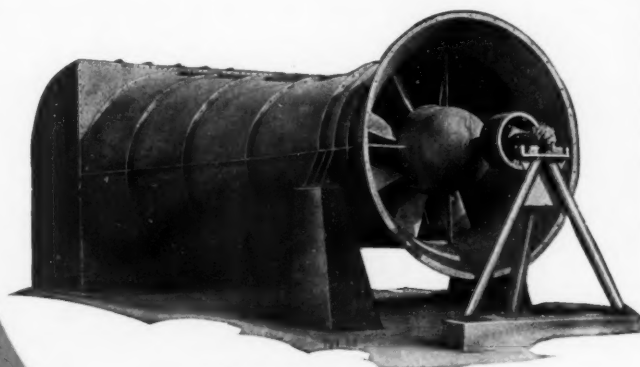


SPIRAL CONVEYORS

The Jeffrey Spiral Conveyor is adapted to handling many materials—used extensively as a processing unit as conveyor and feeder. Can easily be made dust tight.

A type and size bucket elevator (right) to meet your need exactly—with or without casings, spaced or continuous buckets mounted on chain or belt.

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Illustrated, from left to right: Pacific "Slushmaster" Scraper, Pacific "Round-The-Corner" Sheave Block, Pacific Full Shroud Sheave Block.

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MINING WORLD

and the export edition
WORLD MINING

A Miller Freeman Publication

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OCTOBER, 1951

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No. 11

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DRIFTS AND CROSSCUTS

Iron and Steel Industry Cooperation

The great freedoms the citizens of the United States enjoy have created an unprecedented high standard of living. This standard calls for many items in which steel is basic. The iron and steel industry, through freedom of opportunity, has become the world's most productive machine.

Men of long experience, great ability and long range thinking direct the nation's iron and steel plants. They are fully cognizant of their responsibilities to the free world. The record of their achievements indicates the goal of 118,000,000 annual tons of ingot capacity will be reached by 1953 and that iron ore will be available for sustained capacity operations.

Their interest, cooperation, advice and counsel have made publication of the "Iron Ore Outlook" possible.

The Editors take this opportunity to express their appreciation to them and the companies they direct.

The Variables

Every effort has been made to make this report complete and accurate. Facts were obtained from the best authorities and every care was taken in their use, but they will not balance like an accountant's books. There are too many variables.

Iron ore figures are in gross tons—sometimes. Ore requirements for a given period are calculated in terms of 51.50 percent iron. When it is reported that an operation in New York ships 1,000,000 tons, that is 1,000,000 tons of sinter averaging 62 percent iron. The report is made in terms of the weights and measures of the district being discussed.

COMING CONVENTIONS

October 14 through 19, 1951. WORLD METALLURGICAL CONGRESS with the 33rd National Metal Congress and Exposition, Detroit, Michigan.

October 22 through 24, 1951. WESTERN DIVISION AMC, Biltmore Hotel, Los Angeles, California.

October 28 through 31, 1951. Third Congress of the PAN AMERICAN INSTITUTE OF MINING ENGINEERING AND GEOLOGY with a joint meeting of the Geologic Society of America, the Society of Economic Geologists and the American Institute of Mining Engineers. Mexico City, Mexico.

November 15 through 17, 1951. INTERNATIONAL MINING DAYS, El Paso, Texas.

November 30 and 31, 1951. 57th Annual Convention NORTHWEST MINING ASSOCIATION, Davenport Hotel, Spokane, Washington.

January 17 through 19, 1952. Annual Convention NEW MEXICO MINERS & PROSPECTORS ASSOCIATION, Carlsbad, New Mexico.

January 31, February 1 and 2, 1952. Domestic Mining Convention in conjunction with the Annual Convention of the COLORADO MINING ASSOCIATION, Shirley Savoy Hotel, Denver, Colorado.

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33% FASTER
with the new
DJB-2
boom jumbo

● Field reports *prove* that this air-operated boom jumbo will drill out a round in one-third less time than with conventional column and arm methods. That's because *set-up time* is converted into *drilling time*. There's no need to wrestle with heavy arms and machines every time you start a new hole.

An I-R air motor raises or lowers the drill to any desired position at the touch of a finger. It operates the boom through a rugged, self-locking screw drive which prevents creeping or settling, and holds the boom firmly in place even after the air is shut off. This simple, dependable mechanism will withstand abuse and is not easily affected by acid mine water or muck.

The DJM-2 Boom Jumbo is available as a compact, car-mounted unit—complete with built-in air and water piping, self-contained lubricator, and universal, 16-ton ceiling jacks for fast, easy anchoring in any underground location. If desired, the booms can be furnished separately, for installation on single or multiple unit rigs. Ask for full information on the I-R drilling combination, consisting of the Boom Jumbo, DB-35 drifters, aluminum shells and carset Jackbits.



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- FINGER TIP CONTROL
- POSITIVE LOCK
- SIMPLIFIED SWIVELING

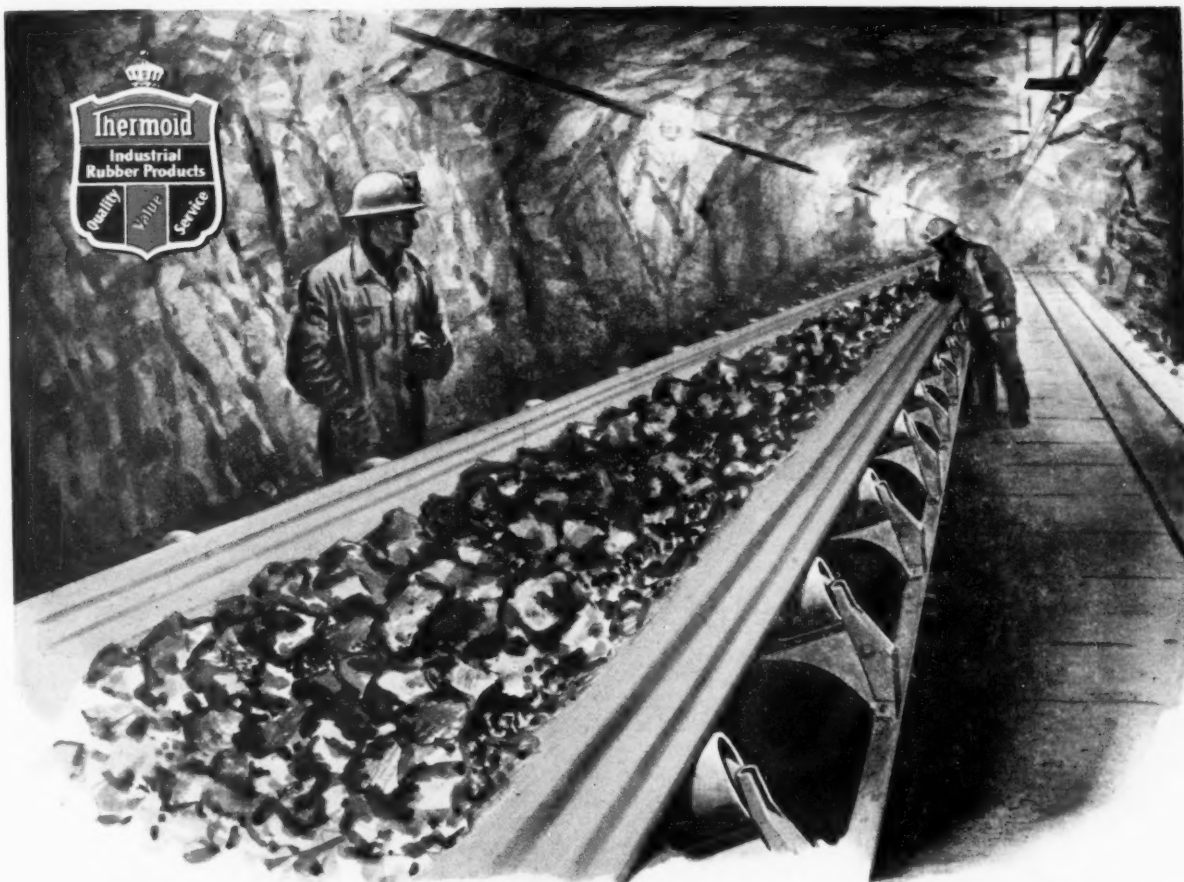
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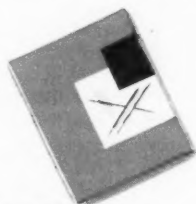
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Current industrial production requirements have created the greatest demand ever made on the mining industry. This means that all tools and equipment are operating at maximum — with consequent stress and strain.

Throughout the mining industry — day after day Thermoid conveyor belting is proving its ability to stand up under this accelerated production — to move materials at lowest cost-per-ton.

Your nearest Thermoid Distributor will gladly recommend and furnish the proper belt for your installation.

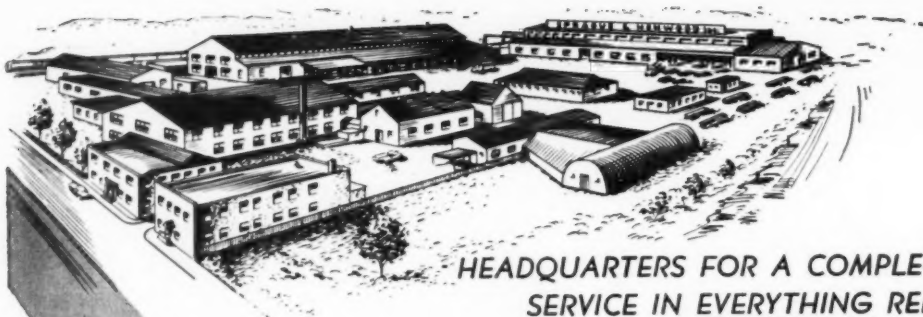
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Model 40-C Core Drilling Machine with Gasoline Engine Power Unit and oil-operated Hydraulic Swivel-head. Other Models are shown in our bulletins and in our "Mining Catalog" insert.

"TRUCAST" BORTZ DIAMOND BITS

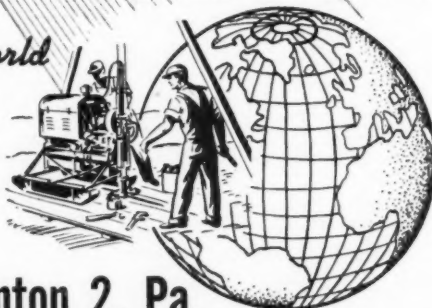


have proved their superiority for years in all types of rock formation. Set with any desired grade of bortz diamonds in a matrix of either copper or nickel alloy and available in a wide variety of standard and special types and sizes, ranging from 1-1/2" to 7-3/4" in diameter. Write for Bulletin No. 44-A.

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CAPITOL CONCENTRATES

Senate Finance Committee Gives Recognition to Mine Development

The Senate Committee on Finances has approved with amendment a House-generated provision in the tax-revision bill permitting the deduction of mine development expenditures as the mineral benefited by such developments is produced and sold. The amended version provided: (a) at the taxpayer's option development expenditures may be deducted in the year incurred, or, as in the House bill, deferred and deducted as the mineral is produced and sold; and (b) during the development period income from the incidental production of minerals, in any year should be offset against development expenses for that year, only the excess of expenditure to be deferred and deducted as the mineral is produced and sold.

● Reports Need Careful Interpretation

One has to be very careful in interpreting the press releases from DMA regarding loans. So far, no actual production expansion loans have been disbursed. All the ballyhoo so far has been for exploration (matching funds) grants, or as Dr. Boyd and Secretary Chapman would have said, "grubstaking." Congressmen are getting letters asking what metal prices are included in these "contracts" and also asking why the writer of the letter does not get a production-expansion loan when the papers indicate others are getting them. The confusion may be deliberate, as DMA is trying hard to make a record in its dying days.

● Why Keep DMA Alive?

The Presidential directive of August 28, which set up the new Defense Materials Procurement Agency, implies that the exploration function may be left with the Interior Department. There is no doubt that the best job DMA has done is in the field of exploration contracts. Still, it would be a gross error to keep DMA alive just to handle exploration, certificates of amortization and priorities. Exploration could well go to DMPA, amortization to DPA, and priorities to NPA. These last two agencies now have to pass on the DMA decisions in those fields anyway.

● It's Only Scuttlebutt—We Hope

The scuttlebutt around Washington is said to have it that Jess Larson is being pressed to appoint no one but big company men for the key jobs in his new DMPA organization. If this should turn out to be true one can kiss goodbye to any notion that a liberal small mines policy, or incentive plan that would aid small mines, will be generated.

● Priority Instructions Given Mines

The Defense Minerals Administration has mailed to everyone holding a mine serial number a copy of a press release dated August 7, together with a copy of order M-78 which sets up the "new" self-rating system of priorities. This system has a great deal of similarity to that set up in World War II. For about the first time, DMA has looked back and taken a leaf out of the old WPB book.

● Some Price Controls Are Lifted

The metals staff at the Office of Price Stabilization has resisted altering the price ceilings on metals and minerals because of the inflationary effect of raw materials on retail prices and on war contracts. However, the pressure became too great and OPS has exempted from

price control manganese ores, chrome ores, cobalt ores and metal, columbite-tantalite ores, natural graphite, kyanite and related ores, acid grade fluorspar, beryl ores, and low-grade asbestos. Sales of domestic, but not imported, mercury also have been excepted.

The effect of this action on market prices will be interesting to observe. Certainly, any domestic price increases will be met by foreign producers.

● Amendment May be Required

The executive order of August 28, which set up the new Defense Materials Procurement agency, failed to mention the metals and minerals division of the Economic Cooperation Administration which was supposed to be transferred along with DMA and the procurement division of GSA. It is understood that the government lawyers found difficulty in transferring this function, plus the money ECA has for its job, by executive order since ECA is set up by specific statutory authority.

Jess Larson, administrator of DMPA, has been seeking legislative relief and it is very likely that the transfer will be accomplished by an amendment to the foreign aid bill, which should be passed by the time this is in print.

● Tungsten Investigation Ordered

Some 50-odd bureaus, committees and agencies are reported to have a finger in the tungsten program. Too many cooks evidently have spoiled the broth as the results to date in the domestic field have not been at all encouraging. As a result, Defense Chief Charles Wilson has appointed a committee, consisting of K. C. Li, Henry Carlisle and I. Joralemon, all well known to the tungsten industry, to formulate a plan which will bring out more production. This should be easy, but will anyone in power pay attention to these distinguished gentlemen?

● Committee Adopts Lodge Amendment

The Senate Committee on Armed Services and Foreign Relations has adopted the Lodge amendment to H. R. 5113 which would "direct the President to submit to Congress a reorganization plan abolishing the ECA and transferring the powers and functions necessary to carry out the purposes of the Mutual Security Act (H. R. 5113) to such other agencies as may be appropriate." This amendment meshes right into the Larson organization plan, which would unify domestic and foreign procurement of minerals under one roof.

● There Is A Great Difference

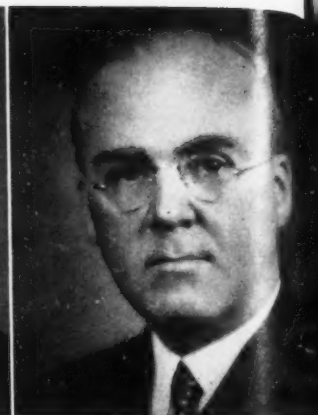
GSA has announced that 2,561 miners and producers have notified the agency that they want to participate in the government's tungsten program. Certainly there must be a reasonable percentage of these who are not indulging in sheer pipe dreams!

To want to participate and to be able to participate, however, are two very different things. The Acting Administrator of DMA, Dr. Schroeder, has admitted that the small producer probably cannot work under the \$63.00 floor program, and that most small operations will have to be subsidized in order to get out tungsten.

Just what is the import of the GSA announcement?

● Exception For Raw Material Facilities

The importance of raw materials to the economy is highlighted by the fact that when ODM Director Wilson suspended the processing of amortization certificates about the middle of August for 60 days, he excepted raw material production facilities.



BENJAMIN F. FAIRLESS, president, United States Steel Corporation. "We of United States Steel believe that there can be no real security without progress and no true progress without growth. So long as America grows and develops, we shall strive to do likewise."
EUGENE G. GRACE, chairman, Bethlehem Steel Corporation. "I don't share the view being put forth in certain directions that there is a great shortage of steel and it is going to get even shorter."

C. M. WHITE, president, Republic Steel Corporation. "During the past few years our steel producing facilities have leaped forward at a fantastic rate. The industry has kept faith with the nation."

ERNEST T. WEIR, chairman, National Steel Corporation. The steel industry has built well ahead of demand—"not just average demand but peak demand."

Increased Steel Output To Supply Demands

You are living in the Steel Age—and will be for a long time, despite constant publicity given to uranium and the "Atomic Age." The demand and uses for steel are growing faster than ever.

Steel is a basic factor in your life and in the United States' economy and security. In a year's time the United States' steel expansion has been double that of Russia's. Steel is so important that the per capita consumption has long been a standard for measuring the nation's degree of civilization, and an up-to-date comparison of yearly steel consumption by each Russian at 275 pounds with that of each American at 1,370 pounds is of primary importance at this time of world unrest. An American has available and uses seven times as much steel as the average person in the rest of the world.

As the rate of industrial and military expansion is dependent on steel availability, of great significance is the fact that the nation's private steel companies are well along with the largest expansion in the shortest period in all history. Dating from the start of the Korean war, 18,000,000 additional tons of steel ingots will be available by the first of 1953.

The 18,000,000 tons of steel, if used solely for war purposes, would be enough to build over 5,000,000 trucks and tractors, 344,000 tanks, 5,200,000 tons of artillery shells and 41,000,000,000 rounds of small-arms ammunition; or would be enough for 38,000 ships of all kinds. If used solely for industrial purposes, this amount of steel would be enough to

build 360,000 railroad sleeping cars or 6,000,000 automobiles and trucks, to make sufficient tin cans, barrels and drums to supply the nation for three years, or to build more than 2,500,000 homes.

In 1943, the year of greatest military use in history, only 31,000,000 ingot tons of steel were classified "direct-war-use," which included ordnance, the aircraft industry, shipbuilding and construction. The current expansion in steel capacity will just about equal the amount of steel allocated for military and direct-supporting defense use in 1951.

To accomplish the history-making record-breaking increase in steel production facilities, more than 40 steel companies in 30 states are spending sums totalling more than \$1,200,000,000 for the purchase of myriad separate items ranging from diamonds to 600-foot-long, Great Lakes ore carriers.

COST OF EXPANSION

The cost of expansion from mines right through to the finished products will be about \$2,500,000,000 the majority of which will be spent in 1951 and 1952. Because of inflation, a record expansion is costing record sums. Today's blast furnace costs \$21,700,000 in contrast to \$10,800,000 in 1939; a Great Lakes ore carrier costing \$1,200,000 in 1926 now cannot be duplicated for less than \$5,000,000; and a 30-ton-capacity dump truck has increased \$6,000 in price in less than two years.

The new ingot steel facilities will cost \$300.00 per ton of capacity com-

pared to existing plants built at an investment of about \$60.00 per ton.

LOCATION OF FACILITIES

The new facilities involved in steel expansion projects are well distributed geographically as shown in Table No. 1. Relative percentages of total capacity for each district show little change excepting in the West where a larger percentage is needed because of the accelerated westward population shift.

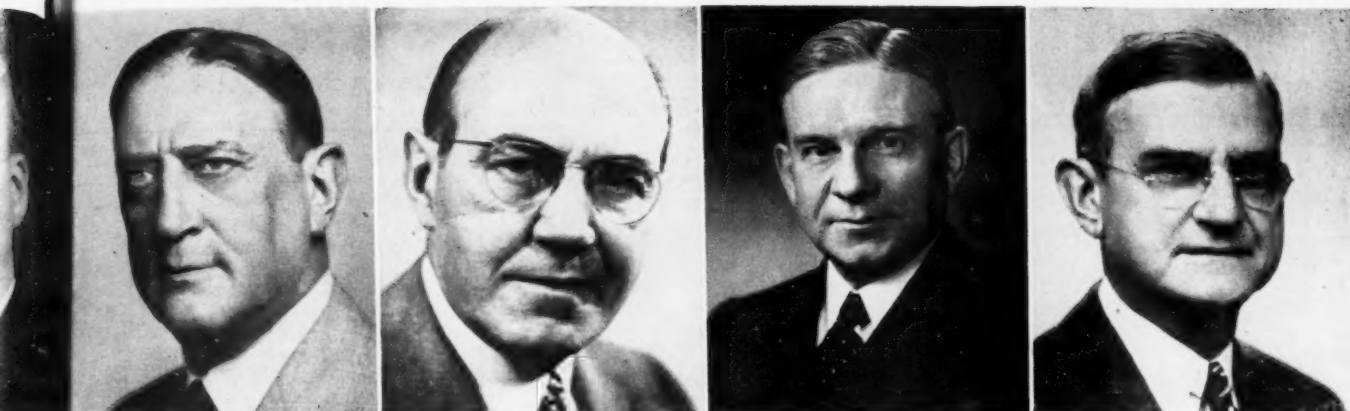
Of primary importance has been the location of new facilities adjacent to existing plants on a basis of simple dollars-and-cents economics. Iron ore availability has been of growing importance and undoubtedly influenced the location of the new Fairless Works of the United States Steel Corporation at Morrisville, Pennsylvania.

STEEL FIRM EXPANSIONS

UNITED STATES STEEL CORPORATION—The largest single increase in the nation's steel capacity is being made by U. S. Steel by the construction of a new integrated steel mill, the Fairless Works, on the Delaware River near Morrisville, Pennsylvania. The plant will have a capacity of 1,800,000 ingot tons of steel a year. It will have facilities to produce a wide range of finished steel products essential to defense and essential civilian uses.

At the Corporation's plants in the Pittsburgh, Pennsylvania and Chi-

MINING WORLD



BEN MOREELL, president, Jones & Laughlin Steel Corporation. "Extraordinary situations require extraordinary measures—I feel sure that our organization will measure up to its responsibilities."
J. L. MAUTHE, president, The Youngstown Sheet & Tube Company. "Back of each employee, to provide him with the tools necessary to assure maximum productivity, stands an investment of approximately \$13,000 in plant and machines."

CLARENCE B. RANDALL, president, Inland Steel Company. "The Inland organization is devoting its fullest effort to increase the production of steel during the present emergency, and we stand ready to serve the nation in whatever capacity we are needed."
CHARLES R. HOOK, chairman, Armco Steel Corporation. "The steel industry stands at the forefront of American preparedness."

cago, Illinois districts improvements and additions to facilities have added 1,660,000 ingot tons to the annual steel-making capacity.

At the Geneva Steel Company's plant at Provo, Utah, a tenth open-hearth furnace is under construction which will increase steel-ingot capacity by 160,000 tons annually.

The Tennessee Coal, Iron & Railroad Company is expanding its steel-making capacity by 500,000 ingot tons annually by enlarging 10 open hearths and building two new ones.

BETHLEHEM STEEL CORPORATION—Authorized additions and improvements to raise pig-iron and steel production are the following: At the Bethlehem plant, Bethlehem, Pennsylvania, improvements in the open hearths will add a capacity of 188,000 annual ingot tons; at the Johnstown plant, Johnstown, Pennsylvania, an increase in ingot capacity of 180,000 tons will raise total capacity to 2,100,000 tons annually and includes the erection of two batteries of coke ovens, two sinter coolers and additional facilities to increase pig-iron and steel-ingot output; the steelmaking capacity at the Sparrows Point Plant, Sparrows Point, Maryland will be raised 740,000 tons to an annual capacity of 5,540,000 tons by the addition of open-hearth facilities, ore screening and sintering equipment and the erection of a battery of coke ovens; at the Steelton plant, Steelton, Pennsylvania, additional facilities and open hearths will increase capacity by 352,000 ingot tons per year to a total of 1,312,000; and at the Los Angeles plant, Los Angeles, California, a new 75-ton electric furnace will be added.

REPUBLIC STEEL CORPORATION—Steel-making facilities now under construction by Republic are extensive: The Cleveland plant at Cleveland, Ohio will be expanded by

672,000 annual tons of steel-ingot capacity to 2,609,000 tons by the erection of 126 by-product coke ovens, a 1,400-ton-per-day blast furnace, four 275-tons-per-heat open-hearth furnaces together with necessary supplemental equipment; at the Thomas Works at Birmingham, Alabama construction of 63 by-product coke ovens will supply the coke necessary to keep a blast furnace in operation with a capacity of 185,000 tons of pig iron annually; two open-hearth furnaces at the Gulfsteel Works, Gadsen, Alabama, will be enlarged to produce 72,000 additional tons of steel per year; steel-making facilities at the Buffalo Works will be increased by 60,000 annual tons by the enlarging of an existing open-hearth furnace; at the Warren Works, Warren, Ohio, blast furnace improvements will add 516,000 tons of steel annually; and at the South Chicago Works, Chicago, Illinois, an open-hearth enlargement now yields 37,000 tons of additional steel per year.

JONES & LAUGHLIN STEEL CORPORATION—At the Pitts-

burgh Works, Pittsburgh, Pennsylvania 11 new open-hearth furnaces are being built. Six are scheduled to make steel in late 1951 and the remaining five in the first half of 1952. At the Otis Works, Cleveland, Ohio a new blast furnace and two new open hearths are scheduled to be in operation before the end of 1951.

NATIONAL STEEL CORPORATION—National's steel expansion is taking place at two of its subsidiary companies' plants. The Great Lakes Steel Corporation is building a blast furnace with an annual capacity of 480,000 tons of pig iron per year at its River Rouge Works. It is scheduled for operation early in 1952. Necessary auxiliary facilities are also under construction.

Weirton Steel Company is building a fourth blast furnace at its Weirton Plant, Weirton, West Virginia. It is scheduled for operation in mid-1952 and will have an annual pig-iron capacity of 480,000 tons.

YOUNGSTOWN SHEET AND TUBE COMPANY—Expansion cen-

TABLE NO. 1
Steel Capacity By Districts and Percentage of U. S. A. Capacity
Measured in Net Ingot Tons for 1950, 1951 and 1953^{1,2}

District	1950		1951		To January 1, 1953	
	Tons	Percent	Tons	Percent	Tons	Percent
Eastern	19,875,000	— 20.0	20,823,320	— 20.0	24,210,000	— 20.5
Pittsburgh-Youngstown	39,146,000	— 39.4	41,411,870	— 39.7	45,090,000	— 38.2
Cleveland-Detroit	9,333,000	— 9.4	9,601,940	— 9.2	12,000,000	— 10.2
Chicago	20,776,000	— 20.9	21,522,750	— 20.7	23,970,000	— 20.3
Southern	4,561,000	— 4.6	4,913,340	— 4.7	6,060,000	— 5.1
Western	5,700,000	— 5.7	5,956,520	— 5.7	6,670,000	— 5.7
Total	99,391,000	—100.0	104,229,650	—100.0	118,000,000	—100.0

¹ 1953 Projected as of January 1, 1953.

² The Eastern district includes the steel plants in Maryland, Delaware, New Jersey, New York, Connecticut, Massachusetts, Rhode Island and all of Eastern Pennsylvania as far as and including Johnstown, about 55 miles east of Pittsburgh.

The Pittsburgh-Youngstown district includes the steel plants in Western Pennsylvania including the Pittsburgh area and the area extending about 100 miles north to include Farrell and Sharon; Kentucky, West Virginia and the steel plants in Ohio, excluding those in Cleveland and Lorain.

The Cleveland-Detroit district includes all of Michigan and the steel plants in Cleveland and Lorain, Ohio. The Chicago district includes the plants in Minnesota, Wisconsin, Missouri, Illinois and Indiana.

The Southern district includes the plants in Virginia, Tennessee, Alabama, Georgia, Oklahoma and Texas. The Western district includes the plants in Colorado, Utah, California, Oregon and Washington.

TABLE NO. 6

[✓] Ore Source. ¹ Ingot Capacity. ² Buying Ore in 1950 from this company. ³ Bethlehem Subsidiary. ⁴ March 1, 1952.

ters at the Indiana Harbor Works, Indiana Harbor, Indiana and consists of the erection of one 28-foot (hearth diameter) blast furnace and necessary facilities to expand plant capacity by 548,000 net tons of pig iron annually. The building of eight additional 250-ton open-hearth furnaces will increase annual ingot capacity by 1,000,000 net tons.

ARMCO STEEL CORPORATION—Additions and plant improvements to Armco's plants at Middletown, Ohio, Ashland, Kentucky, and Butler, Pennsylvania during 1950 resulted in raising pig iron capacity to 465,000 net tons per year. This expansion was largely the result of building three new 250-ton open hearths at Middletown. Annual ingot capacity will be increased 180,000 net tons further at Middletown as a result of having more hot

TABLE NO. 2

Net Tons of Iron Ore, Scrap, Mill Scrap and Limestone Necessary to Produce 1.0 Net Tons of Pig Iron in the U. S. A. in 1949¹

Item	Net Tons
Iron ore	1.753
Scrap	.042
Mill Scrap	.123
Limestone	.428
Coke	.935
Total	3.281

¹ American Iron and Steel Institute.

metal available from the new blast furnace which is scheduled to be completed in November 1952.

The wholly owned subsidiary, Sheffield Steel Corporation, completed a new 150-ton open-hearth furnace at Houston, Texas in February 1950, increasing capacity by 72,000 net tons. A new 100-ton electric melting furnace which was recently completed has an annual capacity of 150,000 net tons. At the Kansas City, Missouri plant a 100-ton electric melting furnace, scheduled for completion by January 1, 1952, will raise annual capacity by 150,000 net tons.

INLAND STEEL COMPANY—Construction now in progress will raise Inland's ingot capacity to 4,500,000 annual tons by March 1, 1952. Increased capacity will come mainly from the building of four new 250-ton open hearth furnaces at the Indiana Harbor works, East Chicago, Indiana. Enlargement of several of the existing 160-ton capacity open hearths to 200-ton capacity will also increase production facilities.

LONE STAR STEEL COMPANY—Four new open hearth furnaces and necessary auxiliary facilities are under construction at the Lone Star Works, Lone Star, Texas. Annual increased output will be 500,000 tons of steel ingots. The plant is scheduled for operation in mid-1952.

OCTOBER, 1951



The Geneva steel plant, of the Geneva Steel Company, subsidiary of United States Steel Corporation, near Provo Utah. This huge plant is typical of the plants which make steel in the United States.

COLORADO FUEL AND IRON CORPORATION—Rebuilding of the "A" blast furnace and additions to the open hearth shop of the corporation's Minnequa works at Pueblo, Colorado will increase the annual ingot capacity by about 90,000 tons.

KAISER STEEL CORPORATION—An eighth open hearth furnace placed in operation at the Fontana, California works in May 1951 increased annual ingot capacity from 1,200,000 to 1,380,000 tons.

TABLE NO. 3

Net Tons of Pig Iron, Scrap and Fluxes Necessary to Produce 1.0 Net Tons of Ingot Steel¹

Item	Net Tons
Pig Iron ²	.618
Scrap ³	.537
Fluxes	.074
Total	1.229

¹ American Iron and Steel Institute.

² 1949 Figures for 98 percent of steel industry.

HOW MUCH ORE?

Based on past experience the amount of 50 per cent natural iron ore needed to make 118,000,000 an-

ual ingot tons is shown in Table Nos. 2 and 3. Any change in steel mill operations below the 100.0 plus percent capacity rate will reduce ore requirements.

Based on 1.753 tons of iron ore to produce 1.0 tons pig iron and 0.618 tons of pig iron to produce 1.0 net tons of ingot steel. Therefore, it takes:

$$\frac{1.753}{1.0} = \frac{\times}{0.618}$$

$$\times = \frac{.618 \times 1.753}{1.0}$$

$\times = 1.082$ tons of iron ore for one ingot ton of steel. 118,000,000 ingot tons $\times 1.082 = 128,000,000$ net tons of iron ore needed for blast furnaces.

An additional 16,000,000 tons of iron ore will be needed for lump charging in open hearths and for merchant pig iron blast furnaces.

The total tonnage needed will therefore be about 144,000,000 net tons.

A decrease in the availability of scrap and a worsening of iron ore grade would, of course, necessitate the use of more iron ore to produce the 18,000,000 ingot tons of steel. This would be a difficult task because of the anticipated small reserve blast furnace capacity.

TABLE NO. 4

1950 Production and Estimated 1951 and 1953 Iron Ore Production By Districts and Requirements

District	1950	1951 ¹	1952	1953 ²
Lake Superior	79,970,000	96,000,000 ³	101,000,000 ⁴	107,400,000 ⁵
Western	5,400,000	7,200,000	7,400,000	8,000,000
Northeastern	4,510,000	4,800,000	5,200,000	5,600,000
Southeastern	7,640,000	7,800,000	7,800,000	8,000,000
Total U. S.	97,520,000	115,800,000	121,400,000	129,000,000
Foreign	7,089,550	11,000,000	13,000,000	15,000,000
	104,609,550	126,800,000	134,400,000	144,000,000 ⁶

¹ Estimated ingot production of 109,000,000 tons.

² 118,000,000 annual ingot tons steel capacity.

³ Includes Lake Superior district in Canada.

⁴ Lake shipments of 96,000,000 tons.

⁵ Includes drawdown of lower lake stockpiles of 4,000,000 tons.

⁶ 114,000,000 needed at 100% capacity. 133,100,000 at 90% capacity of 118,000,000 ingot tons.

TABLE NO. 5

Iron Ore Reserves and Shipments in Gross Tons in Minnesota¹ Michigan² and Wisconsin² from 1946 to 1951

Year	Minnesota		Michigan		Wisconsin	
	Reserves	Shipments	Reserves	Shipments	Reserves	Shipments
1946	1,006,403,041	50,020,000	131,737,606	9,578,000		
1947	1,004,482,442	62,436,102	142,859,378	12,965,482	6,000,000	1,543,099
1948	980,412,870	67,923,237	150,036,389	12,896,478	6,000,000	1,468,953
1949	960,265,700	55,943,714	153,526,348	10,993,239	6,000,000	1,405,775
1950 ³	980,957,892	64,430,000	149,803,358	13,020,000	6,000,000	1,700,000
1951			161,926,901 ⁴		6,000,000	
Total		300,753,053		59,453,199		6,117,827

¹ May 1, 1950.² January 1 of each year.³ Preliminary.⁴ Largest since 1930.

The steel industry has calculated how much ore will be required for the announced steel expansion. On a nationwide basis the estimated tonnage and sources of iron ore by districts for the year 1953, the first year following completion of present expansion are given in Table No. 4.

PLANNED ORE SUPPLY

The record making steel production expansion has of necessity focused attention on the increased problems of iron ore supply for the furnaces.

Steel men know that there is plenty of iron bearing material available, but it is a matter of economics as to which of several sources of iron may be used by each company in the future. By careful long range planning two or more sources of iron units will be available to most steel companies in the period ahead.

The Lake Superior district comprising the Mesabi, Cuyuna and Vermilion Ranges in Minnesota; the Marquette and Menominee Ranges in Michigan; the Gogebic Range in Michigan and Wisconsin; and the Canadian Ranges will con-

tinue to supply the greater part of domestic iron ore for years to come—despite the widely publicized reports that the Mesabi is depleted.

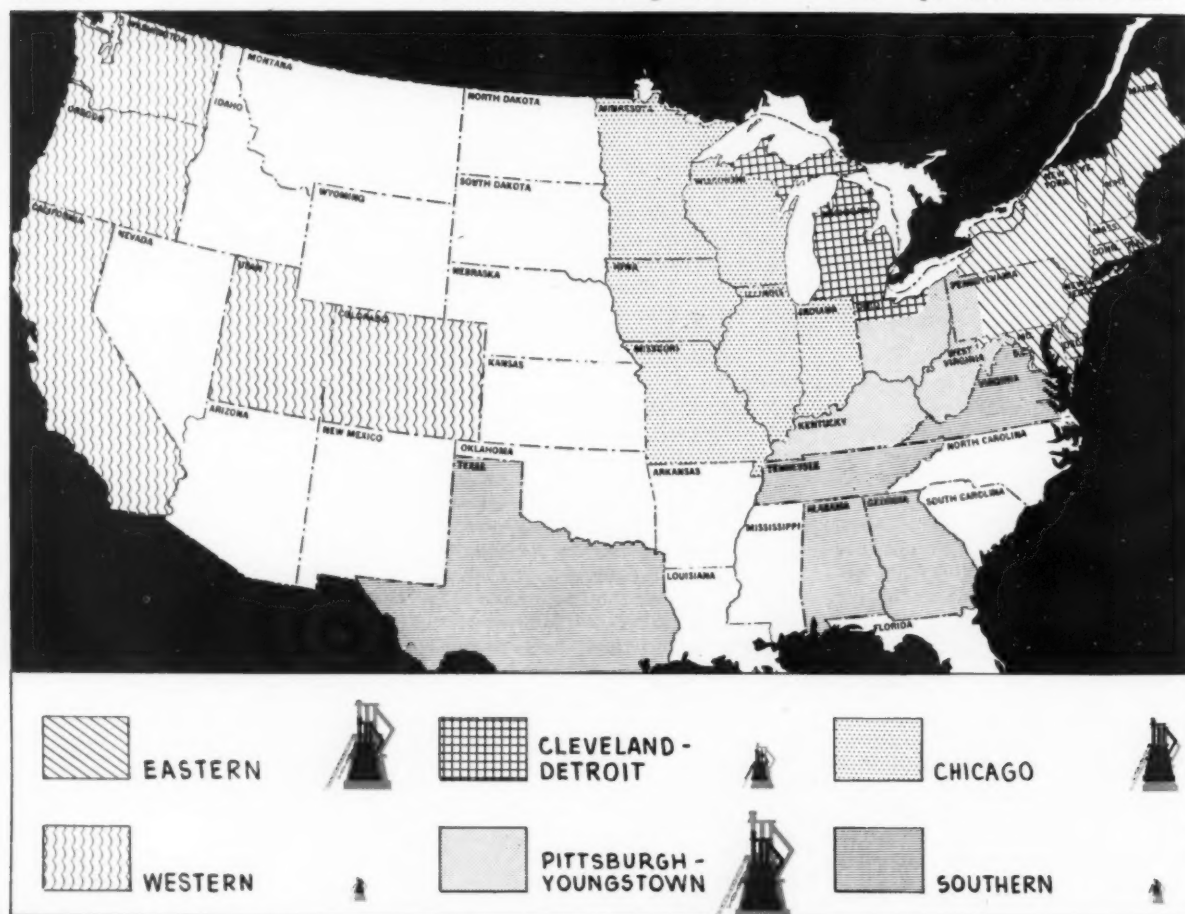
It is significant that in iron as in other types of mining that "ore begets ore" and that exploration, technological advances in mining and beneficiation, higher ore prices and a more favorable governmental policy can and do maintain ore reserves. This is dramatically shown by the figures in Table No. 5.

The miners of the Lake Superior district can and will produce 100,000,000 gross tons of iron ore for each of the next five years if necessary.

The sources of iron ore, present and future, for the large steel producers are shown in Table No. 6. Several will rely on domestic production, taconite and foreign ore and so will be well prepared no matter what the future demands may be.

ORE WILL BE AVAILABLE

The following chapters outline who, where, when and how the increase in ore supply will be made and transported to the steel mills.



DOMESTIC IRON MINING INDUSTRY PREPARES FOR RECORD DEMAND

In 1950, domestic iron ore production plus imported ore totalled 104,609,550 gross tons. Estimated 1953 requirements for capacity operation of the expanded steel industry will be 144,000,000 tons—a 39,390,450-ton increase.

The big question: Where do we get the additional 40,000,000 tons?

Foreign ores? Yes, but only to the extent of some 4,000,000 extra tons before 1954 or 1955.

Taconites? Yes, a trickle; but no significant output is likely before 1956 at best.

Will there be a shortage? No. The iron mining industry of the United States is taking the necessary steps to prevent one. During four months of intensive research, no reliable iron or steel authority expressed doubts to the editors of *Mining World* about the adequacy of iron ore supplies throughout the world. Mr. Elton Hoyt, senior partner, Pickands Mather and Company, summed up the general feeling when he said, "No furnace has ever been shut down because of an iron ore shortage; there is no reason to believe one ever will."

A generally recognized fact that current, domestic, mine expansion plans are not adequate to supply the requirement of 118,000,000 tons of ingot capacity indefinitely. The need can be met, however, during the period required to bring large foreign deposits into production.

During the period required to bring domestic reserves deposits into production, our need for iron ore can be met by tapping domestic reserves at an accelerated rate for a few additional years; and the taconite program can be speeded up to help fill the gap. The comfortable fact is that the United States' iron ore reserves, including taconite, are adequate to supply all needs for many years to come. However, dollars and cents economics make the development of foreign deposits good business.

FOR THE IMMEDIATE FUTURE:

If it were possible to project estimates accurately for 10 years, one might expect to acquire some 30,000,000 tons of ore from imports, nearly 20,000,000 tons from taconite concentrates, and the balance from

other domestic sources. All areas, except Minnesota, should show some increase over present output; production in that State from direct shipping and the so-called intermediate ores would decline. Employment and related activity in the same area would, however, increase due to the mining and processing of large quantities of taconite. The Lake Superior district, largely because of its open pit mines, can, and will act as the balancing factor between supply and demand.

LAKE SUPERIOR

The largest, most numerous and most productive expansion programs are, of course, in the Lake Superior District. Hundreds of millions of dollars are being invested in both short- and long-range programs to increase capacity. At least 30 projects have been completed or are in some stage of development. Space limitations will permit only a brief discussion of most of them.

Hanna Activity High

Building, developing and expanding in almost every direction, with new projects going forward on four of the six iron ranges in Minnesota and Michigan, is The M. A. Hanna Company, operating agent for over a dozen different companies. The term "Hanna Operation" designates a Hanna-managed, not necessarily a Hanna-owned property.

Hanna Mine Operations. Morton mine, near Hibbing, Minnesota, is the most spectacular appearing of the Hanna projects. Here a dragline with 30-yard bucket is loading waste surface material onto a 1½-mile-long conveyor belt to strip some 200 feet of overburden (35,000,000 cubic yards) from property controlled by Hanna, and Inland Steel Company. Stripping started in 1950, and production of 800,000 tons may be obtained in 1953. Output of 1,500,000 tons annually will be possible thereafter.

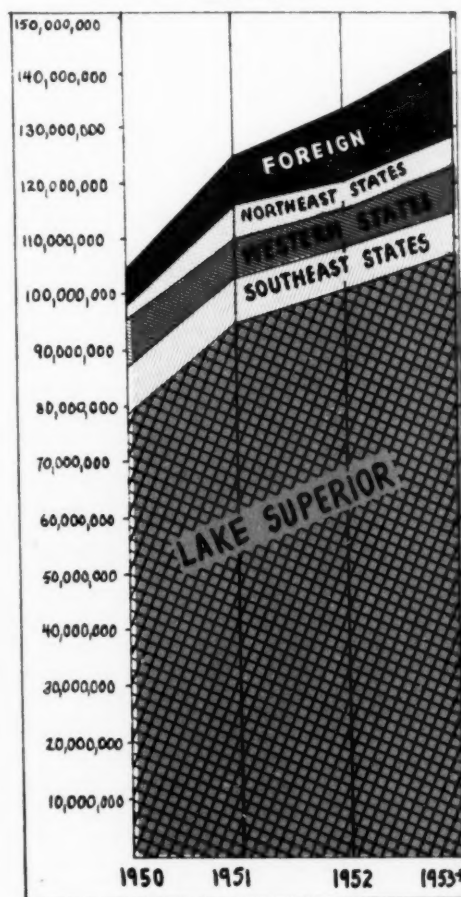
Enterprise mine, near Virginia, Minnesota, is being readied for operation. The surface plant and preliminary preparations will be made this fall, and the orebody will be stripped in 1952. Production of 700,000 to 800,000 tons should be available by 1953.

Carlz mine, Keewatin, Minnesota, is another new development expected to provide about 200,000 tons of ore starting in 1952. Buildings, including a small washing plant, and preliminary stripping are already underway.

Bengal-Tully, east of Stambaugh (Iron River District) Michigan, is among the larger new underground operations starting in Michigan. The surface area has been leveled in preparation for a four-year, several million dollar development that will be ready to produce up to 1,500,000 tons of ore annually by 1955. About 200,000 tons a year are now being mined through the Bengal shaft. This should be increased to the rate of 800,000 tons sometime in late

PROBABLE SOURCES OF IRON ORE FOR EXPANDING STEEL OUTPUT

In Gross Tons





Engineers playing a big part in expanding iron ore production are: LEFT, W. R. Webb, general superintendent of the Jones and Laughlin Ore Company; CENTER, Grover J. Holt, manager of Cleveland-Cliffs Iron Company's Minnesota mines; RIGHT, Carl C. Henning, general manager of raw materials for the Jones & Laughlin Steel Corporation.

1953 and continue to rise as development progresses.

Hanna mills. Not all Hanna activity is confined to stripping orebodies and opening new mines. The company is among the most aggressive in the field of beneficiation—devising means to reclaim material previously regarded as waste. It is pioneering several developments in milling that promise to be successful and make an important contribution to increasing reserves of intermediate ores.

Buckeye mine, near Coleraine, Minnesota, is the site of one. Here, after more than two years of pilot plant work, a commercial installation employing the Dutch State Mines Cyclone Separator process was built to treat all minus- $\frac{1}{4}$ -inch material entering the mill. The circuit, with two 12 inch cyclones, which started operating July 1, has a capacity of 150 tons per hour.

Patrick mine, Cooley, Minnesota, is another place where Hanna is taking one more bite that is netting 200,000 tons per year of blast furnace feed from material considered worthless only two or three years ago. For many years, Patrick ore was treated in a conventional washing plant with the overflow from the washing classifiers being impounded in a series of tailing ponds. These ponds, 20 to 40 feet deep contain about 1,500,000 tons of material (35 percent of total) that will run about minus-6-mesh in size.

A dragline feeds a portable screening plant from which a 12 inch sand pump delivers it to beneficiation. Two stages of gravity concentration in Humphreys Spirals produce a 53 percent product with less than 15 percent silica—usually about 13 percent.

Mesabi Chief mine, near Keewatin, Minnesota, is one of the growing properties in the Hanna group. During the past year, size of the maintenance shops (Diesel-engine over-

haul) has been nearly doubled. The crushing and screening plant will be moved to the south end of the pit bottom, and a conveyor will be installed from crusher to railroad siding, requiring relocation of tracks.

Construction has been started on an HMS plant, in connection with the present washing plant. It will have a capacity of 400 tons per hour and should be ready for operation in 1952. This mill is to adapt facilities to the changing nature of the ore rather than to gain increased capacity.

Groveland mine, near Randville, Michigan, may become Hanna's most revolutionary experiment in beneficiation. If successful, it will give Campbell County (once an important producer) its first active mine in many years.

To mine 25,000 tons of low grade (30 percent) hematite ore an old pit has been reopened, and a pilot plant of 10 tons per hour capacity is being built. The complicated flow sheet contains three stages of grinding and regrinding, Humphreys Spirals for gravity concentration, a magnetic separator and flotation.

Oliver Builds

Oliver Iron Mining Company, subsidiary of U. S. Steel Corporation and largest producer of iron ore in the nation, is taking steps to maintain and expand production with a half dozen building projects. Output in 1950 was about 35,200,000 tons, and will be substantially increased this year. In fact, inadequate lake transportation and a late opening of the shipping season were the limiting factors last year.

Mine Expansion. Auburn mine, South of Virginia, Minnesota, is a new pit that was stripped last winter and placed in limited production in 1951. A rail haulage type ore mine with reserves estimated at 5,400,000 tons, it should be able to produce in excess of 1,000,000 tons annually after another year of preparation.

King mine, near Coleraine, Minnesota, should become an important producer with some ore ready for shipment in the 1952 season. The orebody is now being stripped by the Morrison-Knudson Company. In the same general area, the new washing plant and the dragline-conveyor belt stripping installation at the Gross-Marble mine had their first full season of operation in 1951.

Fraser mine, an underground operation adjacent to the Fraser pit near Buhl, Minnesota, has been the scene of activity for the past several seasons but has not been placed in full production. Shaft and surface buildings have been completed and development of the flat, relatively thin orebody is progressing.

Washing plants. Hull-Rust, world's largest open pit iron mine, near Hibbing, will have a washing plant for the Oliver portion of its operation after this season. The company is building a single circuit plant in connection with the present crushing and screening plant. Erection of the new facility will eliminate the present long rail haul of crude wash ore to the Trout Lake concentrator at Coleraine, and, at the same time, provide treating capacity for the ever increasing volumes of wash ore produced in the two districts. It brings the number of Oliver washing plants to four with a combined capacity of some 4,750,000 tons of concentrate a year.

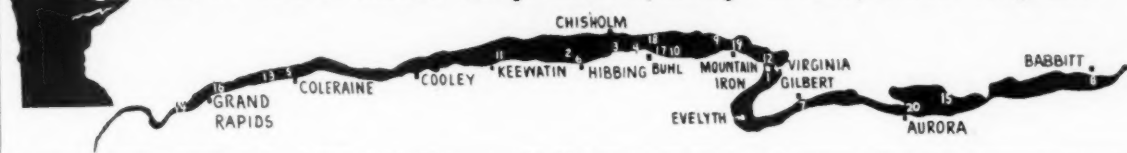
Taconite concentration and agglomeration plants are now being built (see Taconite section for details), and both should be in operation during 1952.

Even now, signs of pressure for increased production are apparent to the visitor at Oliver operations. Scramming, with small equipment to mine out corners and pockets in big pits, has been a respected practice for several years.

Cleveland-Cliffs Expands

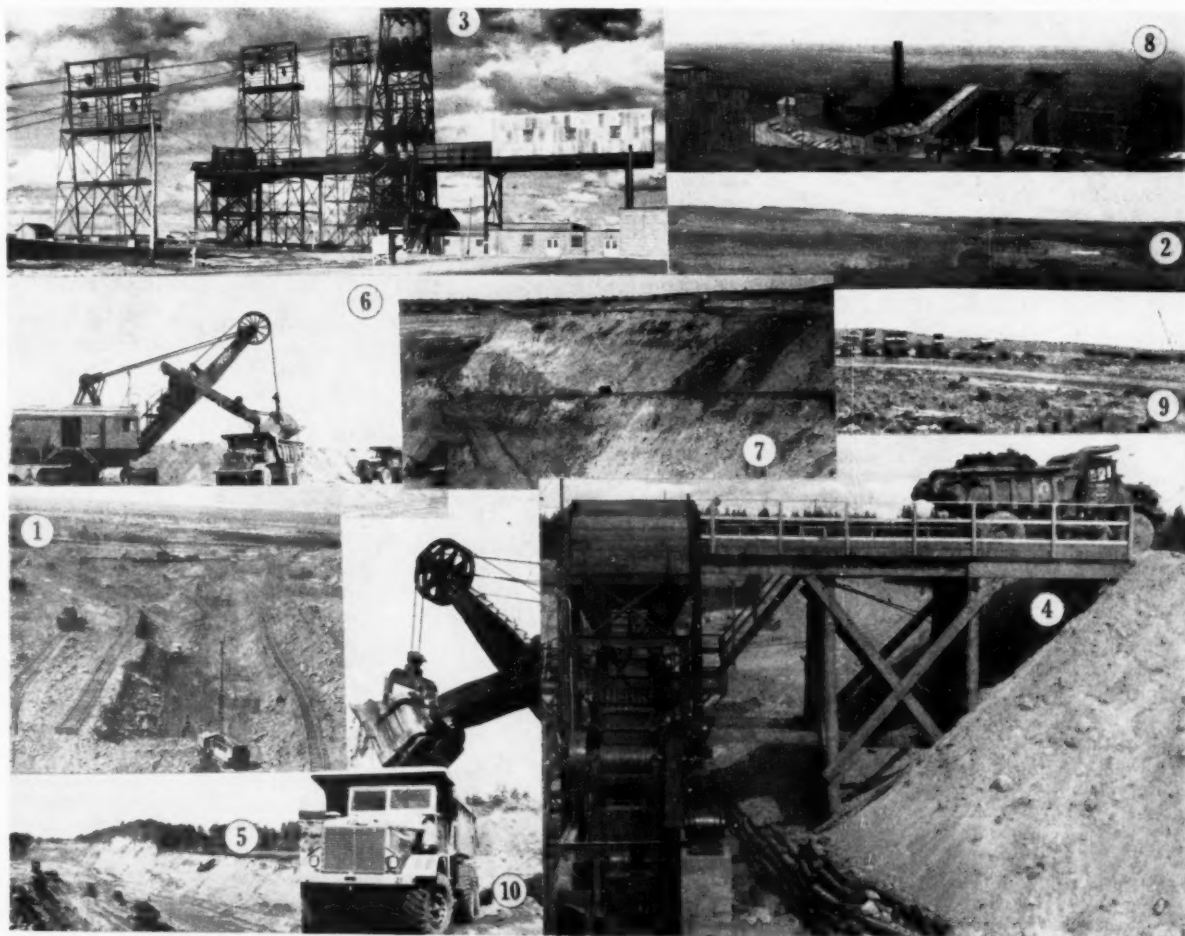
Long the major operator on the Marquette Range of Michigan, where last year the total shipments amounted to approximately 5,000,000 tons of direct shipping ore produced from 14 mines, The Cleveland-Cliffs Iron Company has been most aggressive in improving mining techniques. At the Athens mine the use of block caving was brought back to the Lake Superior District for the first time since the early days of the century when that method was first used at the old Pewabic mine on the Menominee Range. At the Mather mine, "A" and "B" Shafts, block caving has also been adopted. At this property there has also been the first application of

Location of Some Mesabi Range Mine Openings and Expansion Programs



1. Looking north across part of the Auburn open pit south of Virginia. Oliver Iron Mining Company stripped this orebody last winter and placed the mine in limited production this year. 2. Pickands Mather & Company, agents for Ulica Mining Company, are stripping the Carmi-Carson orebody west of Hibbing, Minnesota. The pit is on the left, and the waste pile and building on the right. 3. Headframe and surface plant at the Fraser underground mine of the Oliver Iron Mining Company. It is one of Oliver's newest underground mines. 4. New crushing plant at the Judson open pit mine of the W. S. Moore Company. 5. The top 60 feet of overburden has been stripped from Oliver Iron Mining Company's new King mine at Coleraine, Minnesota. First ore production is scheduled for early 1952. 6. Initial stripping and leveling for the 30-yard walking dragline was done by trucks and shovel at the Morton Ore Company's Morton mine near Hibbing. 7. The new Pettit mine of the Inter-State Iron Company at Gilbert City, Minnesota will be developed to the north of the company's Schley open pit mine. 8. Reserve

Mining Company is using the old building of the Mesabi Iron Company at Babbitt, Minnesota to speed its pilot plant taconite operations. This is a general view of the plant taken from the hillside above the truck road. 9. Site of the new Oliver Iron Mining Company taconite experimental pilot plant in July of this year. Stearns-Roger Manufacturing Company of Denver, Colorado, has the contract for erecting this half million ton capacity plant. 10. Stripping operations at the Snyder Mining Company's new Whiteside open pit mine at Buhl, Minnesota are proceeding on a round-the-clock schedule. 11. Carlz mine of the M. A. Hanna Company. 12. Enterprise Reserve mine of the M. A. Hanna Company. 13. Jessie mine of the Hallock Construction Company. 14. Jordan Reserve mine of the W. S. Moore Company. 15. Knox mine of the W. S. Moore Company. 16. Lind-Greenway mines of the Inter-State Iron Company. 17. Margaret mine of the W. S. Moore Company. 18. North Shiras mine of the Pacific Isle Mining Company. 19. Pilot Annex mine of the W. S. Moore Company. 20. St. James mine of the St. James Mining Company, Oglebay Norton and Company agents.



arched-steel sets to support underground drifts. Among other successful innovations is the use of conveyor belts for the stockpiling of ore at Mather Mine "B" Shaft.

Negaunee mine, in Michigan, idle

since May 1949, is now being deepened from 1,400 to 3,500 feet. Preliminary repair work was accomplished during the past winter, and actual shaft sinking with a Bucyrus-Erie hydromucker started in

March. When the shaft sinking is completed in 1952, ore hoisting operations at the Athens mine will be transferred to the new Negaunee shaft, and it is also planned that



Northern Michigan is second only to the Carlsbad, New Mexico potash district in domestic shaft sinking activity. Pictured here are three of the new shafts. LEFT: Newest of the mines in Michigan is the Tracy mine, Jones & Laughlin Ore Company has started shaft sinking and construction of a surface plant at this mine east of Negaunee, Michigan. CENTER: Shaft sinking and other preparations for opening the Cayia mine, east of Iron River, Michigan, are being pushed by the Inland Steel Company. RIGHT: A tall steel headframe is rising rapidly at the new Ironton shaft of the Puritan Mining Company near Bessemer, Michigan. Adjacent properties formerly operated through other shafts at much shallower elevations will be mined through this larger and deeper shaft. Pickands Mather, the operating company, also has a major shaft sinking and development program under way at the Berkshire Mine in the Iron River District.

other nearby reserves will be developed from the Negaunee.

Also a Leader in Milling

In research and development of beneficiation practice, Cleveland-Cliffs has for the past several years ranked among the leaders. In 1944 a test laboratory was placed in operation at the Holman-Cliffs Mine of The Mesabi-Cliffs Mining Company, and in 1949 a large modern research laboratory was opened at Ishpeming, Michigan. Research of flotation, pelletizing and other concentrating problems is being carried forward together with studies to improve present operating techniques.

The first HMS plant on the Marquette Range is being constructed at the Ohio mine at Michigamme, Michigan, to commence operations in 1952. This plant will treat ore from the Webster, Ohio, Norwood and other adjacent properties. The mill will be capable of producing 200,000 tons of concentrates per year and will be a standard HMS circuit with a Wemco drum separatory vessel. Humphreys Spirals will be used to concentrate the fine particle sizes.

Holman-Cliffs, Taconite, Minnesota, is also a scene of much activity. Under construction is an experimental fine ore treating plant that will employ a Cyclone Separator and a Hardinge drum separatory vessel in an HMS circuit to treat minus- $\frac{1}{4}$ -inch material. This is the first semi-commercial sized plant to employ the Hardinge type of separator on fine material exclusively.

At the same mine construction of an HMS plant with Hardinge drum separator has been started for use in treating lean ore stockpiles. This 250-ton per hour capacity plant will

increase the output from this property.

CCI's Hawkins mine, Nashwauk, Minnesota, will also have a new mill building incorporating both the washing and HMS in its flowsheet. The crude ore will be delivered directly to the plant by conveyor from the pit, and the plant will have a capacity of 800 tons of crude ore per hour. This will be ready for operation in 1952.

P-M Readies New Mines

Pickands Mather & Co., second largest iron ore producer in the nation, is both opening new mines and expanding old mines. The company is currently operating five concentrating plants on the Mesabi Range and is presently constructing a sixth at the Scranton mine near Hibbing. It has also operated for some years a large experimental laboratory at Hibbing, Minnesota, for investigation of various kinds of ore treatment. Major metallurgical effort is being placed on the preliminary taconite pilot plant of the Erie Mining Company at Aurora, Minnesota.

The Carmi-Carson Lake mine, a property of the Utica Mining Company west of Hibbing, Minnesota, on the Mesabi Range and the Rabbit Lake mine, a property of The Youngstown Mines Corporation on the Cuyuna Range, are being stripped for production in 1952.

Ironton mine, Bessemer, Michigan, is undergoing a large scale development which includes the sinking of a new large-capacity shaft to a depth of 3,600 feet. Pickands Mather, as agents for Puritan Mining Company, plan to mine through this new Ironton shaft adjacent properties that were formerly mined at shallow depths through smaller

shafts. Future annual capacity is estimated at 1,000,000 tons.

Berkshire mine in the Iron River, Michigan District is also the scene of underground development activity. The shaft is being enlarged and readied for the production of large tonnages from the Buck, Caspian and other nearby properties. Here several mines which are or have produced from individual shafts will become a consolidated operation hoisting through a central shaft.

As a part of the 1951 production effort, lean ore stockpiles are being reclaimed at the Albany mine near Hibbing, Minnesota, and at the Biwabik mine on the east end of the Mesabi Range.

MANY NEW MINES

The accent is on new mines—production from heretofore undeveloped orebodies. Many of these are small or deep deposits that would have been uneconomic a few years ago. In addition to those mines of the four largest producers (see above), several are being readied for operation by other major companies.

Jones and Laughlin Ore Company is sinking the 2,800 foot Tracy mine shaft east of Negaunee, Michigan, one of the largest of the new properties, with a planned capacity of 1,000,000 tons annually. A complete surface plant with all of the usual facilities is being built. First production, probably about 100,000 tons, should be in 1954. Production will begin after 1,568 feet of depth has been reached, and ore from the Lucky Star, Tracy, Baraga and Foley orebodies will be hoisted through the shaft.

MINING WORLD

Snyder Mining Company has started to strip its Whiteside mine near Buhl, Minnesota, a difficult property to open. Its relatively small body of ore lies under a deep overburden of glacial drift and a rather thick strata of oxidized taconite.

Stripping of the unconsolidated material was started in mid-May by the Al Johnson Construction Company of Minneapolis, Minnesota. Snyder will strip the taconite ahead of mining. Ore will be hoisted in 20-ton skips operating on an incline to be built at one pit limit.

The mine will replace production soon to be lost with the exhaustion of the Virginia mine near Eveleth and the Shenango mine at Chisholm and provide some increased tonnage as well.

Oglebay Norton & Company as Manager for The St. James Mining Company is opening a new mine, the St. James, at Aurora, Minnesota. Stripping is now under way and production of 400,000 tons a year should be available in 1952 to replace the Oglebay Norton & Company's loss of tonnage from The Castile Mining Company's Eureka Mine, exhausted in 1950. No substantial increase in the company's 1,500,000 tons of annual output is expected from this source. The St. James will have a crushing and screening plant in the pit and conveyor belt to the railroad siding. No washing plant will be needed.

As operating agents for Reserve Mining Company, Oglebay Norton's largest current activity is in connection with the taconite program at Babbitt (see Taconite Section) where a pilot plant is being built.

Interstate Iron Company subsidiary of J&L, has stripped its Schley mine at Gilbert, Minnesota. Another deep orebody which requires a side hill skipway for raising ore, the Schley will produce some ore—perhaps 300,000 tons this year. This will be increased to 500,000 tons in 1952. The adjacent Pettit-orebody is being stripped and will be mined as a part of the Schley operation. Development work is also in process for opening the Wentworth and Lind-Greenway mines.

Interstate Iron has been operating five mines with a combined output averaging 3,200,000 gross tons annually. The reduction in production of regular grade ores at the Hill-Annex mine is only partially replaced by the heavy media plant which was installed last year to treat lean ores at this mine. Also, its Grant and Sullivan mines will be exhausted by the end of this season. The Schley, Pettit, Wentworth and Lind-Greenway should replace

these losses and hold annual output at about its present level.

Inland Steel Corporation plans to continue with a production of 1,500,000 to 1,750,000 tons annually; and has one new mine, the Cayia, east of Crystal Falls, Michigan, under development to assure that output. The Cayia will be a medium sized property with a capacity of 250,000 tons a year. Shaft sinking and construction started in May of last year, and some production from development should be forthcoming by the end of 1952.

The company's Bristol mine in the same district, which started producing in 1950, is now in full scale operation and should be dependable source of 200,000 tons of ore annually.

An experimental switch of mining method, from top slicing to sub level stoping, at Inland's No. 2 mine on the Cuyuna Range promises to effect operating economies—possibly even increase production slightly.

NEW MILLS

Iron ore beneficiation is really beginning to come into its own. Each year the Minnesota landscape is dotted with an increasing number of mills to treat intermediate ore. Over a dozen are in the process of being planned, erected or enlarged. These mills, largely HMS plants of the prefabricated type with capacities of 75 to 150 tons per hour, are proving to be one really large source of "new reserves."

Coons-Pacific Company, owned jointly by The E. W. Coons Com-

pany and the Pacific Isle Mining Company, is erecting a Wemco Mobil Mill, of 150 tons per hour capacity, south of Eveleth, Minnesota. Each of the companies operate mines in the district, and part of the crude ore will be treated in the new plant.

The flowsheet provides for the plus- $\frac{1}{4}$ -inch to minus- $1\frac{1}{2}$ -inch material to be handled in a drum separator. Two 6-cell Pan American jigs will treat the material down to plus-48-mesh and the balance will be concentrated in Humphreys Spirals.

W. S. Moore Company has started treating ore from the Prindle mine in a 150 ton per hour capacity Mobil Mill. Moore took over the abandoned Prindle in 1947, built a washing plant and shipped some concentrate. In order to increase reserves and expand production, the HMS plant was built in 1950 and started to produce early this season.

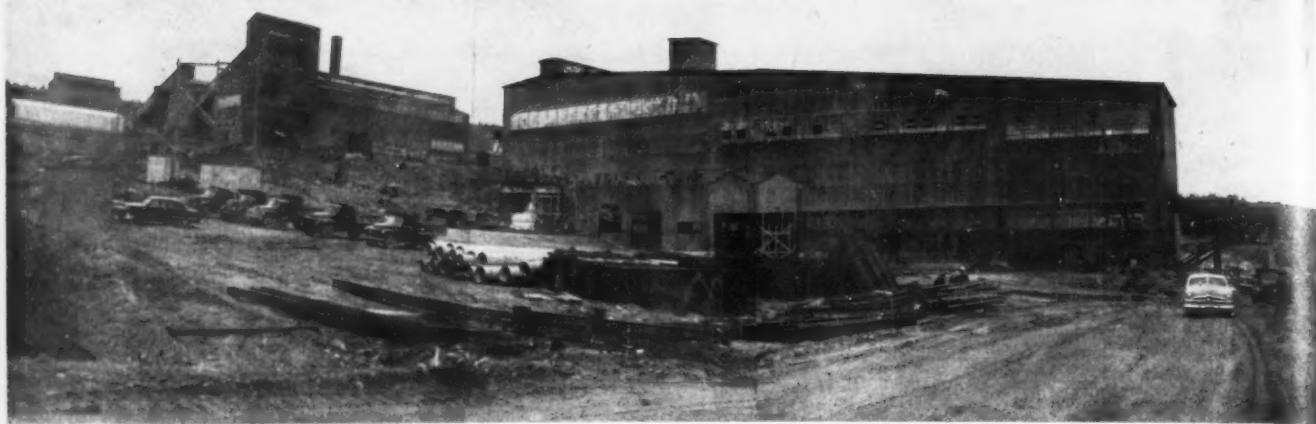
Charleson Iron Company, operating a jig plant on the lean ore dump from the Missabe Mountain Mine near Virginia, Minnesota is not building to increase capacity; but its activity illustrates a situation that is general in plants throughout the district. Grade of crude is dropping rapidly. The size of the first jig in each circuit is being increased by 25 percent, and all conveyors are being enlarged to handle up to 25 percent larger tonnages. Concentrate shipments will probably remain about constant.

This is not meant to indicate that the 25 percent increase is dictated entirely by lower grade. Actually, the plant was producing well over its

Continued on Page 90

Lone Star Steel Company mines its ore with draglines in north eastern Texas.





Reserve Mining Company is rehabilitating the old plant of the Mesabi Iron Company at Babbitt, Minnesota as a pilot plant for taconite. This picture taken 30 days after the start of remodeling shows how rapidly the project is proceeding. From the crusher plant at far left the taconite is ground, magnetically concentrated and conveyed to the balling drum and pelletizing furnaces in the building at the far right. A new rod mill building will be built between the two large buildings. The power shovel seen above the row of trucks is excavating for the foundations.

TACONITE---IRON UNITS FOR THE FUTURE

With one plant in operation and two being built in Minnesota a new era of mining, concentration and furnacing has arrived

Taconite means many things to many different people. To the driller "it is a hard tough rock—hard to drill a hole in"; to the metallurgist it is "as low cost a source of iron units as foreign ore"; and to the vice president of a gigantic steel corporation it is "the permanent foundation of American industry."

To the American citizen taconite is of far greater but less known significance. It is a source of iron units in the United States close to existing steel furnaces and not endangered by foreign government expropriation or the war time difficulties of ocean transportation.

WHAT IS TACONITE?

Taconite is a term generally restricted to the Mesabi Range's Biwabik iron formation above the Pokegama quartzite and below the Virginia slate which is too low in iron to be considered as iron ore. A further modification of the term has been made to more accurately describe the individual formations as the irregular-banded, cherty, or slaty taconite. In turn, these are further described as either magnetic or non-magnetic.

For the purposes of this article, the term taconite is meant to be the magnetic portion of the lower cherty formation. Magnetite is the ore mineral.

Taconite has a variety of tex-

tures, depending on size and arrangement of the magnetite and gangue minerals. Much of the formation is banded. It has an average density of 3.45 and its chemical composition is remarkably uniform.

According to Sections 1 to 4, inclusive, of Minnesota Laws of 1941, Chapter 375, taconite is defined as "ferruginous chert or ferruginous slate in the form of compact, silicious rock, in which the iron oxide is so finely disseminated that substantially all of the iron-bearing particles of merchantable grade are smaller than 20 mesh. Taconite may be further defined as ore-bearing rock which is not merchantable as iron ore in its natural state, and which cannot be made merchantable by simple methods of beneficiation involving only crushing, screening, washing, jigging, drying or any combination thereof."

TACONITE RESEARCH

For many years the Mines Experiment Station of the University of Minnesota at Minneapolis has carried on a concentrated research program directed toward the commercial production of concentrate from taconite. Under the direction of E. W. Davis, station director, and Henry H. Wade, assistant director, research findings and developments led to laboratory pilot-plant testing which pointed the way to the larger

pilot plants of the Erie Mining Company and the Reserve Mining Company.

The large steel companies and their iron-ore suppliers have been and are continuing their laboratory studies of all phases of taconite mining, concentration and blast furnacing.

PILOT PLANTS

Erie Mining Company

The first modern, large-scale, preliminary taconite plant was placed in operation by this company in which Bethlehem Steel Corporation, Youngstown Sheet & Tube Company, Dalton Ore Company, Interlake Iron Corporation and Pickands Mather & Co. are interested. Pickands Mather acts as operator and manager. This plant is northeast of Aurora. Construction was started in 1948 and after much experimental work the first pellets were shipped. Total shipments for the year were 15,756 tons. As plant operating techniques improved and operating personnel were trained, production rose, and, in 1950, shipments were 62,087 tons.

Shipments of Erie pellets have been made to Bethlehem steel plants and, in early 1951, to the Indiana Harbor, Indiana and Campbell, (Youngstown) Ohio plants of the Youngstown Sheet and Tube Company. They were used in open

MINING WORLD

hearth at Indiana Harbor and blast furnaces at the Campbell plant.

Reserve Mining Operations

Reserve Mining Company, which has acquired about 10,000 acres of land containing low grade iron ore called taconite, on the eastern end of the Mesabi Range at Babbitt, Minnesota, is owned by Republic Steel Corporation, Armco Steel Corporation, and National Steel Corporation, and is managed by Oglebay, Norton and Company.

In December 1950, Reserve Mining announced plans for the construction of a pilot taconite plant with an annual capacity of 300,000 tons of 60-percent-iron pellets at Babbitt, Minnesota. The pilot plant will have three primary functions:

1. To determine the best method to produce pellets at the lowest iron-unit cost.
2. Ascertain the optimum size, speed, power requirements and types of equipment to be used in a future commercial-scale plant.
3. Train operating personnel for any future commercial plant.

These plans include the development of an open pit mine, reconstructing the present buildings on the property, installation of new equipment, and building a new modern town with 80 two-and-three bedroom houses.

On June 1st the F. H. McGraw Construction Company of Middletown, Ohio started remodeling and

rebuilding the mill. The Duluth Missabe and Iron Range Railway Company is constructing 2.5 miles of standard gauge line and switching facilities to service the plant. Construction of a two-mile long, 20-inch diameter water line is underway from the mill to Birch Lake. The line will supply the plant with 4,000 gallons per minute. Two-thirds of the water used in the mill can be reclaimed and used again.

Reserve Open Pit

Mining will be carried on with a six-yard electric shovel, equipped with a five-yard bucket, loading into 22-ton Diesel powered trucks. Benches will be established at 35-foot heights. Jet-piercing and wagon drills will be used. In order to determine best blasting practices there will be established and maintained an up-to-date, accurate record of all drilling, blasting, and loading. Every hole will be mapped and logged from the time it is spotted until taconite broken by powder detonated in the hole is loaded. Various types of powders will be used for blasting.

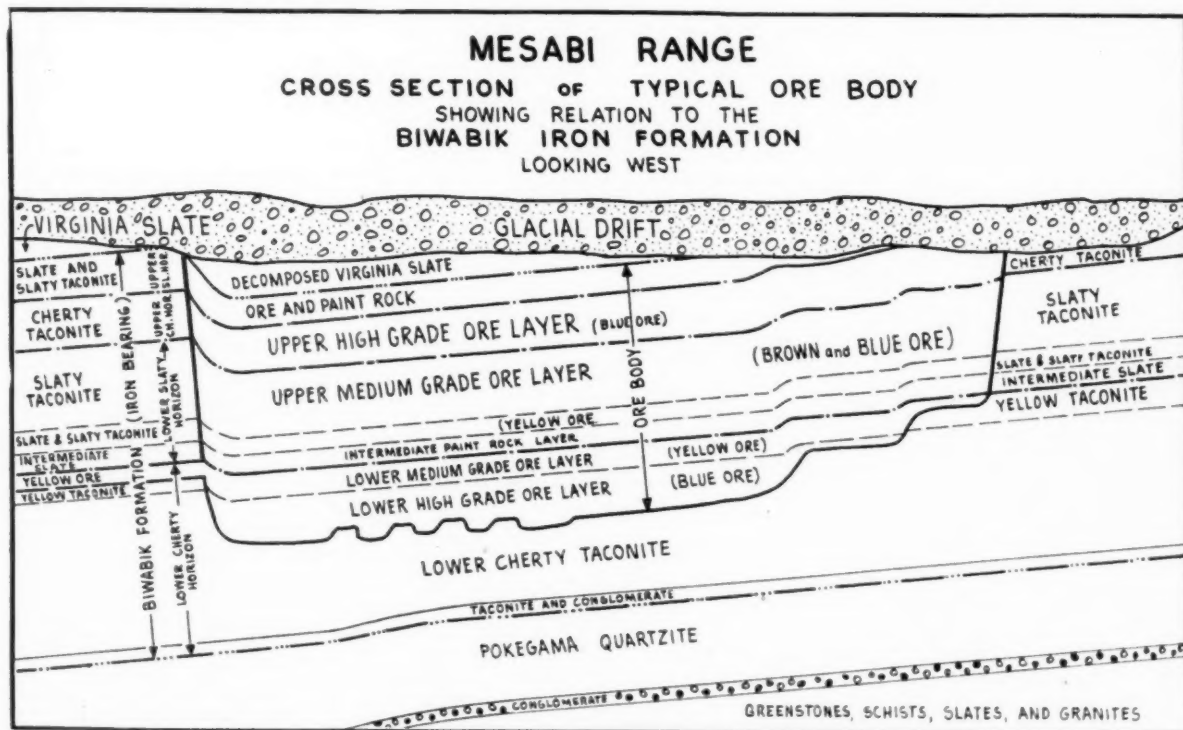
The Pilot Plant Mill

Taconite from the pit will be trucked to the remodeled crushing plant where it will be reduced to 4-inch size in gyratory crushers and thence to ¾-inch in cone crushers.

A 10½ by 12 foot rod mill will be used for grinding the ¾-inch taconite

to 6-mesh, at which size 30 percent of the crude will be eliminated as tailing in drum magnetic separators. The concentrate from these separators will be ground in a closed circuit consisting of ball mills, drum magnetic separators, and mechanical classifiers. The ball mill discharge will be cobbled in drum magnetic separators. The concentrate from these separators will be classified at 150-mesh, the rake product being returned to the ball mill for further grinding and the 150-mesh overflow being laundered to hydroseparators. An additional 30 percent of the taconite will be eliminated in the aforementioned magnetic separators, the classifier overflow being 40 percent of the original feed to the rod mill. The overflow from the hydroseparators will be discarded as tailing and the underflow treated in magnetic separators to produce a concentrate assaying about 64 percent iron (dried) and representing between 30 and 35 percent of the original crude ore. This final concentrate will be thickened and filtered on drum filters.

The filter cake will be fed into balling drums and the pellets formed at the drums will be conveyed to four 250-ton capacity shaft furnaces. It is expected to also use other types of furnaces for experimental purposes shortly after going into operation. The furnaces will be oil-fired through bottom tuyeres.





The balling drum—key unit in taconite concentration. The finely ground concentrate is fed into the far end of the slowly revolving drum. The rotation of the drum causes the fine particles to stick together and build larger and larger pellets which reach a diameter of about one inch before they drop out of the drum in the foreground.

Blast Furnace Results

More than 15,000 tons of pellets have been used in a blast furnace test at Ashland, Kentucky, with percentages of charge varying from 30 to 70 percent pellets. The operation of the furnace was satisfactory.

Beaver Bay Plant

Design and engineering work is being pushed on the first commercial-scale plant slated for construction on the northern shore of Lake Superior at Beaver Bay. Not for at least five years will this plant be in operation. A complete harbor, plant, power plant, town, and a 47-mile-long railroad will have to be built. Primary crushing will be done at the mine. Water from Lake Superior will be used in the large plant and tailing will be deposited in the bottom of the Lake. The Lake will be an important factor in overcoming two of the taconite problems—water and tailing disposal.

Oliver's Program

The Oliver Iron Mining Company has long carried on a research program at its Duluth laboratory, directed toward solving basic problems in the utilization of taconite. Expanding activity from the laboratory, the first field operation was the drilling of more than 65,000 feet of diamond-drill hole in the Biwabik formation north of Mountain Iron, Minnesota, to obtain detailed knowledge of the formation and its magnetic and total iron content. The cores gave valuable geologic data and were subsequently used for

laboratory testing.

On May 17, 1951, ground was broken two miles north of Mountain Iron for a taconite, pilot, beneficiation plant which will treat 2,000,000 tons of iron material per year to produce 500,000 tons of concentrate.

The new plant has been designed to test several flowsheets and is scheduled for operation in July 1952. The plant flowsheet will incorporate four stages of crushing giving approximately one inch, top size, feed for further reduction in a rod mill to minus-10-mesh. The magnetic concentrate is then separated and re-ground in a ball mill in closed circuit with a hydro-separator and classifier to produce a minus-200-mesh product. This product is then subjected to magnetic separators, making a finished magnetic concentrate.

This concentrate will be filtered and transported to Oliver's new sintering and nodulizing plant near Virginia. This plant was started in April 1950 and the first sinter experiments were produced in July 1951. While waiting the completion of the taconite pilot plant, this plant will be used to sinter fines from the adjacent Rouchleau crushing and screening plant.

Experimental Mine

A new open-pit mine will be developed one mile southwest of the beneficiation plant. Churn and Quarry Master drills will be used. The broken taconite will be loaded by electric shovels into railroad cars for transportation to the plant.

TACONITE MINING

Taconite deposits are applicable to open-pit mining because they are large in size, dip only a few degrees, and are covered by only a thin mantle of overburden. Large production can best be attained by use of open-pit-type mechanized equipment.

Drilling

It has been proven that churn drilling of magnetic taconite is not economically possible. Large drills have had a penetration rate of less than eight feet per shift and a bit life for only four inches of hole. The cost of diamond drilling the required number of holes in which to place enough powder to break the taconite precludes this method of drilling. Jet-Piercing described in the Mining Chapter has proven to be the best-known method of making blast holes.

CONCENTRATION NOTES

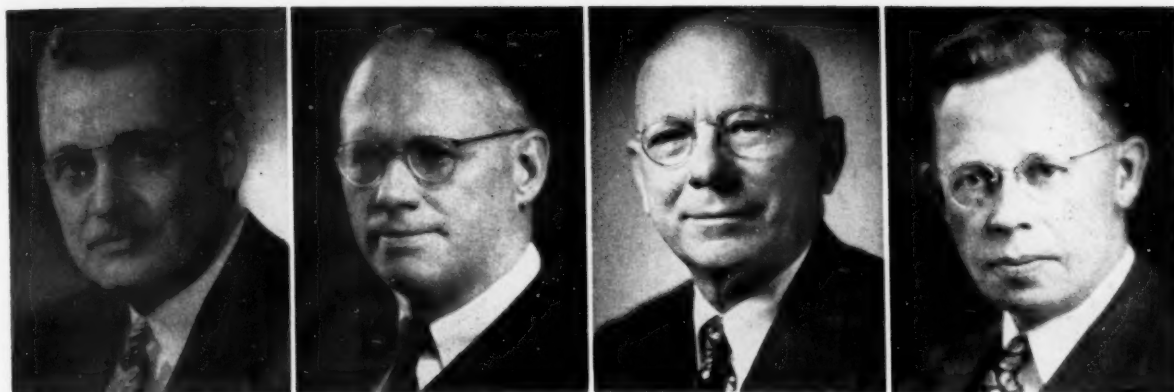
Taconite concentration tests and initial plant operations have been guided by the following factors essential to any large-scale, commercial operation:

1. Cost must be cheap, from mine right through to pellets. Three tons of taconite must be mined and treated to produce one ton of concentrate, compared to less than 1.5 tons of Mesabi wash ore per ton of concentrate.
2. The grade of concentrate must be high.
3. The final product must be homogeneous.
4. The loss of as little magnetite as possible is necessary because of cost.
5. The final product must be such that it can be stockpiled and re-claimed easily with no deterioration due to storage.

The extensive laboratory work of many companies and the actual preliminary plant operation of the Erie Mining Company has resulted in much information about the beneficiation of taconite. This work is important because basic fundamentals have been learned and tested. What to do and, of equal importance, what not to do. Available information includes the following:

Taconite, while hard to drill, is surprisingly easy to grind—shattering under impact load. It is tough. Force is required to break it. Steel consumption for crushing and grinding is fairly high.

Close filter control is necessary as



Key figures in taconite developments are, LEFT TO RIGHT, E. M. Richards, vice president, planning and development for the Republic Steel Corporation; Walter L. Maxson, director of research for the Oliver Iron Mining Company; Frank J. Smith, Vice president in charge of iron ore operations of Oglebay Norton & Company which is operating agent for the Reserve Mining Company; and Rudolph T. Elstad, president of the Oliver Iron Mining Company.

a dry filter cake is essential for effective pelletizing. Water, 9.5 percent, in the cake must be limited to a plus or minus variation of 1.0 percent. It has been found that best pelletizing results are obtained when the concentrate is minus-325-mesh in size.

The separation and discarding of a low-grade tailing after rod milling and before classification is of primary importance to attain low cost. Separation is made by a magnetic separator and overflow wash box. Over 60 percent of the initial feed is discarded in a tailing which contains less than five percent magnetic iron. As a result the grade of feed to the ball mill is more than twice that of the heads.

Several binding agents, such as Black Hills-type Bentonite or starch, have been added to the belt feeding the slowly rotating (balling) drum where the concentrate is rolled into nearly round balls about one inch in diameter. However, successful tests have been made where the addition of no binding agent was necessary.

Various methods and types of furnaces have been tried for firing pellets. Bottom-fired vertical furnaces are the most popular to date. There have been good results when the height of the furnace is equal to the diameter of the heating zone. Rate of feed is regulated by the bottom draw-off of the fired pellets. The pellets drop through the furnace at the rate of one-half to one inch per minute. Furnace temperatures reach 2,300 F. from the burning of the 1.3 percent added anthracite coal in the pellets, but the discharged pellets have a temperature to about 400° F. Furnace gases discharging at the top of the furnace are not hot—only warm enough to carry away the water from the balled concentrate.

Research is continuing on the firing of pellets on a travelling-grate sintering machine.

COSTS

Much publicity has been given to possible costs of taconite mining, concentration, pelletizing, and firing. A great deal of confusion has resulted because of the unfortunate tendency of many to compare these costs with those of the Mesabi Range open pits. From a more realistic standpoint, taconite costs can and will be competitive with the cost per iron unit with ore produced in the deep underground Michigan mines.

The accompanying table gives various cost estimates. The September 1947 estimate published in the first Iron Edition of this magazine was carefully prepared. It is the basis for the October 1951 estimate taking into account the following changes.

There has been an increase of 1.175 in the ratio between the September 1947 Bureau of Labor Statistics Wholesale Commodity Price Index and the August 1951 Index

(New). The cost of labor (base pay) on the Mesabi Range, St. Louis County, Minnesota, has increased 1.11 times in the same period. The greatest increase in cost, and one which cannot be changed by technological advances, is for depreciation and interest. The cost of obtaining money to finance an operation has skyrocketed with the cost of equipment. Amortization of capital investment is a major cost item. In early September the taconite plants had not received accelerated amortization certificates of necessity, for five-year tax write-offs similar to those issued to the steel industry to aid in their expansions.

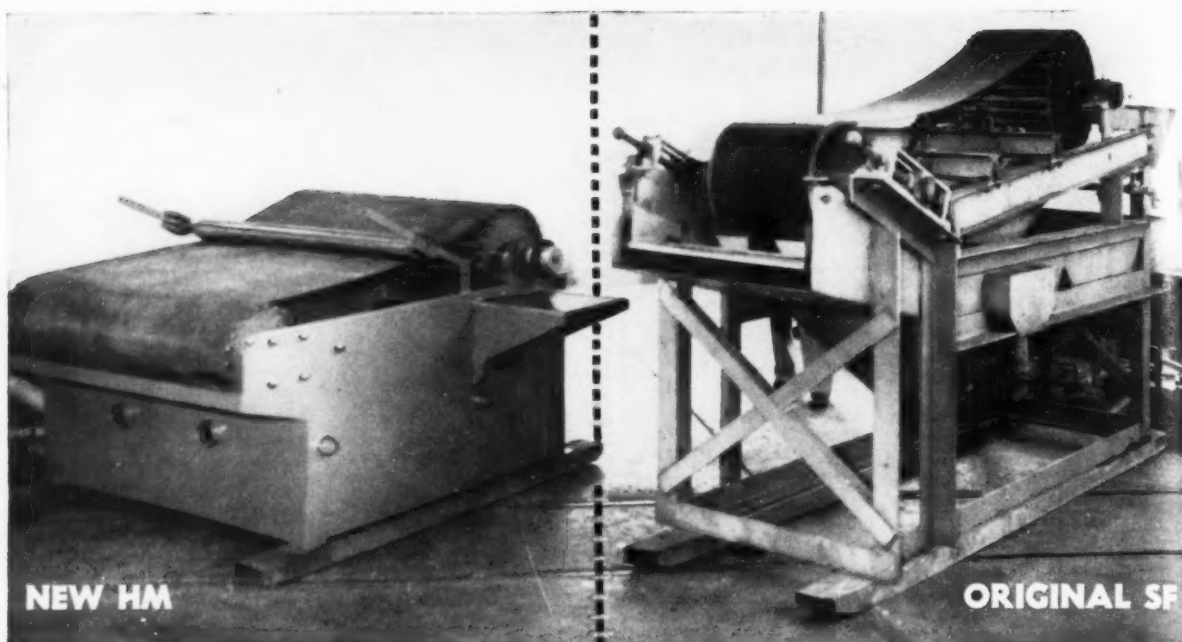
THE FUTURE

A new industry has been created in Minnesota. A new source of iron units for America's steel industry reassures the nation's strength for peace and defense. New towns are springing up—the forerunner of more to come. Railroads, harbors, oxygen plants, electric power plants, and giant concentrators now in the planning stage will be tomorrow's reality.

ESTIMATED COSTS OF PRODUCING ONE GROSS TON OF CRUDE TACONITE AND TACONITE PELLETS

Item	"Mining World" September 1947		"Mining Engineering" September 1950		"Beneficiation of Taconite" University of Minnesota Mines Experiment Station October 27, 1950		"Mining World" October 1951	
	Crude ¹	Sinter ¹	Crude ²	Concentrate ²	Crude ³	Pellets ³	Crude ³	Pellet
Mining and Transportation	\$0.441	\$1.323	\$0.65 ³	\$1.79 ³			\$0.60	\$1.80
Concentrating	0.482	1.446			\$1.56	\$4.70	.63	1.89
Agglomerating	0.333	1.0	0.36	1.000			.40	1.20
Taxes	0.050	0.150	0.54	0.15	0.07	.20	.10	.30
Royalty	0.072	0.216	0.08	0.22	0.05	.15	.08	.24
Depreciation and Interest	0.171	0.513			.50	1.50	.50	1.50
Transportation (Babbitt to Beaver Bay)			0.55	1.10				
Amortization			0.18	0.50				
Total	\$1.549	\$4.648	\$2.36	\$4.76	\$2.18	\$6.55	\$2.31	\$6.93

¹ Ratio of concentration 3 to 1
² Ratio of concentration 2.75 to 1.0
³ Does not include transportation



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TRANSPORT BOTTLENECK ON LAKES WILL BE ELIMINATED BY FAST NEW ORE CARRIERS

During 1951 and 1952 more Great Lakes ore carriers either are being built or are scheduled for construction than during any period since 1906 to 1910. The limiting factor in Lake Superior iron ore production is the carrying capacity of the ore fleet, and, although additional vessels are being commissioned, not until well into 1952 will there be enough in service—including Canadian flag charters—to increase ore movement appreciably to lower lake ports.

To augment lake shipments, the Oliver Iron Mining Company for the first time in history is moving large tonnages of "all rail" ore during the Great Lakes shipping season. These rail shipments, to eastern steel mills from mines on the Mesabi Range, are a continuation of Oliver's 1950-1951 winter rail shipment.

EFFICIENT ORE COMMITTEE

The Ore Operating Committee of the Lake Ore, Coal and Vessel Committee is doing a remarkable job of scheduling and correlating mining, rail shipment, vessel loading, water shipment and unloading so as to speed ore shipments and utilize transportation equipment as efficiently as possible. Members of the committee are: A. D. Chisholm, Pickands, Mather & Company; J. E. Machamer, Oliver Iron Mining Company; R. W. Whitney, Hanna Iron Ore Company; G. J. Holt, Cleveland-Cliffs Iron Company; F. H. Cash, Republic Steel Corporation; O. A. Sundness, Snyder Mining Company; H. H. Harrison, Pacific Isle Mining Company; and R. D. Satterley, Inland Steel Company.

So effective has been the committee's work that ore mined one day can be railed to Duluth the same evening and loaded into the mining company's ore boat before the next morning.

In 1942, the record year, 92,076,781 tons were shipped in boats. However there was an exceptionally early opening of navigation that year and 8,649,708 tons were shipped to May 1st or 3,837,672 tons more than average of the next nine shipping seasons. In all probability the average for these years would have been greater if the same urgency of demand had existed. An early opening of navigation is an important factor. In 1949 the shipments previous to May 1st exceeded those of

1942 by 717,871 tons. The average of shipment before May 1st during the past 10 years is 5,195,803 tons.

With 41 less vessels in June 1951 than in the record year of 1942, the June 1951 shipments were the greatest for that month in history because of faster loading, greater average vessel speed and tighter scheduling.

VESSEL CONSTRUCTION

In operation on The Lakes are eight boats 50 or more years old, 230 built 20 or more years ago and 256 built more than five years ago. The newest vessels are, of course, both larger and faster. Those being built will have a loaded speed of more than 16 statute miles per hour* in contrast to the average 11.5 miles an hour of the existing fleet. Thirty-five to 40 round trips per season will be made by these vessels in contrast to the fleet average of between 30 and 35. Table No. 7 summarizes vessel construction.

OCEAN CARRIERS

The M. A. Hanna Company has ordered two giant ore carriers—30,000-ton capacity each and the largest ever to be built—for delivery in 1955. They will be used to transport Labrador-Quebec iron ore from Seven Islands, Quebec to Montreal, Quebec, Philadelphia, Pennsylvania and Baltimore, Maryland.

The ships will be 630 feet long, 85.5 feet wide and have a molded

depth of 45.6 feet. They will have a single propeller with a normal horsepower of 12,500 and a speed of 15.5 knots.

RAIL—RANGE TO LAKES

As one prominent member of the Ore Committee said, "elimination of the Lake ore-carrier bottleneck will only create another bottleneck."

Anxiety has arisen as to the ability of the railroads to handle an anticipated shipment of 96,000,000 tons of ore in 1952 from the Lake Superior district mines and through the docks. An analysis of transportation therefore must include the railroads' part and what they are doing to handle additional ore tonnage.

EXISTING RAIL FACILITIES

The ore mined on the Ranges is moved to upper Lake ports in large volume during a period of 232 days (75-year average) by several railroads.

DM & IR

The Duluth Missabe and Iron Range Railway Company handles the greatest tonnage of iron ore from mines to Lake docks. It gathers ore from mines on the Mesabi or Vermillion Ranges at 11 assembly points. The average, 51.45-ton, car of ore was moved 78.82 miles in

*Great Lakes vessel speed is expressed in miles per hour instead of knots.

The inbound "Leon Fraser" enters Duluth harbor to load a cargo of iron ore at the Duluth Missabe & Iron Range Railway Company's dock.



OSGOOD



MINING MAGIC!

To even the most experienced operators the mining ability of the advanced OSGOOD model 1000 Shovel seems little short of magic . . . so instant, accurate, and velvet-smooth is the big 2½-yard machine's response to every touch of the muscle-saving controls that activate all motions by air . . . so capable is the shovel of long, sustained operation with very little time-out for adjustments or repairs . . . so easily

are mountains of rock, soil, coal, and other materials moved in record time. Patented OSGOOD Air Cushion Clutches completely eliminate jerking, grabbing, and the many daily time-consuming adjustments necessary in other machines. Choice of Caterpillar D-17000, Buda 6-DC-1879 or GM 8103 engine. Quick conversion from shovel to dragline, clamshell, or crane. Write today.

EQUIPMENT DESIGNED WITH YOUR PROFIT IN MIND



5176

The OSGOOD COMPANY

MARION, OHIO

AFFILIATED WITH THE GENERAL EXCAVATOR CO.

POWER SHOVELS, CRANES
DRAGLINES, CLAMSHELLS
PILE DRIVERS & BACK HOES
CRAWLERS & MOBILCRANES
DIESEL, GASOLINE OR
ELECTRIC POWERED
CAPACITIES ¾ TO 2½ CU. YD

MINING WORLD

1946 to ore docks at either Duluth or Two Harbors, Minnesota. The line now has about 14,000 ore cars in service. Because of steep grades the ore trains are broken up into two or three sections at Proctor, Minnesota.

GREAT NORTHERN

The Great Northern Railway Company handles the second largest tonnage of ore, all to docks at Superior, Wisconsin. Berthing facilities at the docks permit simultaneous loading of 24 vessels. These docks handle some 50 separate "ore grades." Sequential car to pocket to vessel dumping blends the ore to grades set by the shipper by a block-numbering system. To move this ore the company normally uses about 7,500 ore cars and numerous steam locomotives. The average haul from mine to docks in 1946 was 114.26 miles and the average ore per car was 62.85 tons. For assembling cars from the various mines the company has 115.9 miles of spur trackage and operates four switching yards. The principal yard is at Kelly Lake near Hibbing, Minnesota. Average car-loading time at the mines is eight hours, hauling to the assembly yard takes about five hours and from Kelly Lake to the Allouez classification yard, about 100 miles, is 5.5 hours. An average outbound train of 180 cars holds ore from seven mines for shipment in 14 vessels. The average vessel loads from 12 trains.

ALL-RAIL SHIPMENTS

Because of the limitation of Lake transportation all-rail shipments of ore were initiated in mid-1950 from the Mesabi Range to Pittsburgh, Pennsylvania. They continued until ore froze in the cars in November. A trial shipment of 135 cars using calcium chloride to prevent freezing



The railroads are ready for the big transportation job ahead. New cars and yard expansion mean faster blending of ore into the docks.

was made from Hibbing in the last week of 1950.

The shipment was a success and the method has been continued by the Oliver Iron Mining Company, Cleveland-Cliffs Iron Company and the Republic Steel Corporation to Pittsburgh, Pennsylvania; Gary, Indiana; South Chicago, Indiana; and Youngstown, Ohio. A description of blending these shipments is included in the mining section.

RAILROADS ARE READY

The DM&IR through its modern docks at Duluth and Two Harbors, Minnesota, in 1942 handled 46.46 percent of Lake shipment; 1949 43.87 percent, 1950 45.85 percent and up to July 1, 1951 46.25 percent. This railroad has extensive yards at Proctor and Two Harbors. Orders have been placed for 1,500 additional ore cars. Enough locomotive power exists to meet requirements. The company will be prepared to handle in excess of 50,000,000 tons of ore. The

capacity of the two docks at Duluth and three docks at Two Harbors is 437,600 tons. The capacity of the frozen-ore car-steaming plant at Proctor is being increased from a capacity 240 cars to 360 cars and at Two Harbors from 180 cars to 270 cars. Major alterations will be made in Dock No. 1 at Two Harbors. Among other features the spouts and doors will be changed, to expedite the loading of the large boats now being constructed.

The Great Northern Railway Company has four modern docks located at Superior, Wisconsin with a capacity of 441,800 tons. Nearly all of the shipping companies are served by this railroad resulting in special problems from handling a great variety of grades. The Great Northern Railway Company's docks in 1942 handled 31.20 percent of the total Lake shipments, in 1949 32.20 percent, in 1950 30.23 percent, and to July 1, 1951 32.28 percent. The railroad handled 28,717,689 tons in 1942 and from present indications will exceed that tonnage in 1951.

Continued on Page 109

Lake Superior Iron Ore Shipments From Upper Lake Ports From 1942 to September 17, 1951 ^{1 2}

Month	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951
March	792,602							499,293		
April	7,857,106	1,954,817	5,288,079	7,282,074	729,902	4,448,411	7,677,270	8,868,286	348,804	6,211,474
May	8,649,708	1,954,817	5,288,079	7,282,074	729,902	4,448,411	7,677,270	9,367,579	348,804	6,211,474
	12,677,356	10,974,672	12,114,211	11,121,203	3,616,115	10,372,853	11,609,367	11,655,668	9,496,448	12,664,095
June	21,327,064	12,929,489	17,402,290	18,403,277	4,346,017	14,821,264	19,286,548	21,023,247	9,845,252	18,875,569
	12,625,102	11,864,401	11,974,640	10,621,309	8,654,437	11,457,455	11,727,367	12,162,323	11,737,951	13,166,130 ³
	33,952,166	24,793,890	29,376,930	29,024,586	13,000,454	26,278,719	31,013,896	33,185,570	21,583,203	32,041,699
July	13,405,408	13,588,814	12,908,972	11,372,282	10,848,385	12,613,820	11,821,019	12,767,718	12,703,591	13,574,174
	47,357,574	38,382,704	42,285,902	40,396,868	23,848,839	38,892,539	42,834,915	45,953,288	34,286,794	45,615,873
August	13,235,960	13,976,770	12,288,253	10,731,804	9,774,442	12,122,244	11,734,794	11,314,928	12,482,069	13,228,868
	60,593,534	52,359,474	54,574,155	51,128,672	33,623,281	51,014,783	54,569,709	57,268,216	46,768,863	58,844,741
Sept.	11,847,919	12,742,821	11,329,029	10,543,099	9,636,353	10,684,778	10,598,735	9,460,608	12,190,669	6,924,339 ⁴
	72,441,453	65,102,295	65,903,184	61,671,771	43,259,634	61,699,561	65,168,444	66,728,824	58,959,539	65,769,080 ⁴
Oct.	11,417,074	11,612,542	10,594,987	9,826,622	9,209,304	9,784,550	10,028,578	1,574,813	11,380,306	
	83,858,527	76,714,837	76,498,171	71,498,393	52,468,938	71,484,111	75,197,022	68,282,382	70,339,845	
Nov.	7,582,425	6,940,503	4,672,367	4,145,322	6,701,305	5,877,006	8,239,451	1,103,167	6,993,233	
	91,440,952	83,655,340	81,170,538	75,643,715	59,170,243	77,361,117	82,436,473	69,385,549	77,333,078	
Dec.	635,829	749,312		71,035	247,083	536,970	500,818	170,720	872,638	
Total	92,076,781	84,404,852	81,170,538	75,714,750	59,417,326	77,898,087	82,937,192	69,556,269	78,205,681	
Fleet Vessels	306	319	287	283	269	272	267	266	268	
Capacity	2,814,390	2,984,490	2,770,150	2,758,750	2,653,050	2,671,850	2,631,550	2,622,250	2,649,500	
Average	9,197	9,356	9,652	9,748	9,863	9,823	9,856	9,858	9,890	

¹ United States and Canadian ports. ² Gross tons, railroad weight. ³ Record June shipment. ⁴ Through Sept. 17.

ACTIVITIES OF U. S. MINING MEN

Earl E. Hunner has retired from the M. A. Hanna Company, Cleveland, after 34 years. He had been assistant general manager, and then general manager of the Lake Superior operations. In 1946 he became executive consultant.

Marvin Kay has been named vice president and general manager of the Climax Uranium Company in Colorado. E. J. Duggan and Blair Burwell will serve as consultants. Mr. Kay has been manager of operations at Ouray for the American Lead Zinc Company since 1947.

Stanley Hughes has been named assistant to the general manager of Kennecott Copper Corporation's western mining divisions—smelting and refining operations. The Utah division also announces the promotion of P. H. Ensign to general superintendent of mills, A. C. Johnson to chief metallurgical engineer, succeeding the late T. A. Janney, Neil Plummer to metallurgical engineer at the Arthur plant, and A. C. Carman to general mill foreman at Magna.

W. C. Page, vice president and general manager of Western Operations, United States Smelting Refining and Mining Company, Salt Lake City, Utah, has announced the following promotions. Byron E. Grant, assistant manager of western mines, has been appointed as assistant to the vice president and general manager of Western Operations. Oscar A. Glaeser also is assistant to the vice president and general manager of Western Operations. J. M. Ehrhorn, formerly Superintendent of the U. S. Section of the U. S. and Lark Mine, was appointed assistant to the manager of western mines. John W. Holmes, who was acting superintendent, has been appointed to the position of superintendent of the U. S. Section.

Murray Clark of Reynolds Metal Company, R. B. Derr of the Aluminum Ore Company, D. A. Rhoades of the Kaiser Aluminum and Chemical Corporation, and Richard L. Davies of the Penn Salt Manufacturing Company were members of the Aluminum Metal Advisory Committee which met with government officials in Washington recently to discuss the problems involved in securing the raw materials used for aluminum metal. The group has been designated the Aluminum Industry Advisory Committee on Raw Materials.

Edward T. Redman, manager of the Reno office of Anaconda Lead and Silver



HAROLD S. WORCESTER of Cripple Creek, Colorado, has been elected president of King Lease, Inc., Ouray, Colorado. King Lease operates the world famous Camp Bird mine. Worcester is also vice president of the Colorado Mining Association

and a member of the Colorado State Metal Mining Fund Board. For the last year he has been director and assistant general manager of the Golden Cycle Corporation. Prior to that he was president of Telluride Mines, Inc. at Telluride, Colorado.



HOWARD I. YOUNG, president of the American Zinc Lead & Smelting Company, has been appointed administrator of the metals and minerals section of the new Defense Materials Procurement Agency. His return to government service is in a position

similar to the one he held during World War II as director of the Minerals Coordinating Division, and as chairman of the Mineral Resources Operating Committee and Minerals and Metals Advisory Committee of the War Production Board. He is a past president of the American Zinc Institute, Inc.

Company, has been elected vice president of the company. They have moved their Reno offices to 207 American Building in Reno.

Alan A. Bakewell, Jr., has been named mine project engineer of Kennecott Copper Corporation's new Deep Ruth mine at Ruth, Nevada. He will serve as liaison agent between the firm and the contracting companies working on the Ruth project.

Robert P. Wallis has been elected president of Columbia Lead and Zinc Mining Company, Spokane, Washington. Harry J. Homad is the new vice president and Harold S. Johnston, secretary-treasurer. Frank J. Luedke and Raymen Paulsen have been named to the board of directors.

Charles Johnson, former assistant pit foreman of the Bennett Mining Company, Pickands Mather operating agent, has succeeded Frank Dumbrosky as general pit foreman of the Bennett mine at Keewatin, Minnesota, following Mr. Dumbrosky's retirement.

Gerald E. Eddy has been appointed director of the Michigan department of conservation. He had formerly been state geologist and chief of geological survey. Franklin G. Pardee, mining geologist and engineer, succeeds Mr. Eddy as state geologist. Wayland Osgood, secretary of the state commission of conservation, has been appointed deputy director of the department of conservation.

Jack Chisholm of Taconite, Minnesota, acting superintendent of the Canisteo mine of the Cleveland Cliffs Iron Company, has resigned to accept a position with the Steel Company of Canada in Hamilton, Ontario. He has been succeeded by Ronald Pearson of Hibbing, Minnesota, assistant chief engineer for the company. Allen B. Hallett of Taconite has been promoted to assistant chief engineer at the Hibbing office.

Curtis Bonneville has been made general foreman of Kaiser Steel Corporation's merchant-skelp mill, Fontana, California. A metallurgist, he had worked for the Carnegie-Illinois Steel Corporation until joining Kaiser in 1942 in the chemical laboratory. In 1943 he transferred to the inspection department and in 1944 to production.

Angelo Corradi was one of six M. A. Hanna Company employees appointed foremen for various of the company's Minnesota mines recently. He is now ship foreman at the Morton mine. George Koemptgen is foreman on the conveyor-dragline stripping operation at the Morton. Herman Wirtz is wash plant foreman in the Cooley district as is Nathan Martin. John Gernert is pit foreman at the Weggum mine, and Arvie Lake is wash plant foreman at the Perry mine.

Ken Garff, president of Austin Jumbo Mines, Inc., which is near Winnemucca, Nevada, announced that Erving Walters has been made superintendent of mining operations, succeeding A. J. Kirkman, who has become superintendent of pit operations for the Uterock Mining Company of Utah. William Marshall, former general mine superintendent for Austin Jumbo, is now on a government job in South America, and so far no one has replaced him.

Frederick B. Heitkamp has been made a director of Calumet and Hecla Consolidated Copper Company, Boston, Massachusetts. He is a vice president and director of Daystrom, Incorporated. R. N. Haskell of Lake Linden, Michigan, former superintendent of Calumet's mills and reclamation plants, retired June 1.

JOHN E. GURVIN will be manager of the Monsanto Chemical Company's multi-million dollar phosphate plant when it begins operating some time next year at Soda Springs, Idaho. He is now in charge of construction of the plant.



The company will both mine and process phosphate rock at its Idaho property.

Verne L. Strahan, sampling mill foreman at the Phelps Dodge Corporation smelter, Douglas, Arizona, has retired after 33 years of service.

Harmon E. Keyes, chemical and metallurgical engineer, has joined the technical staff of Inflico Inc., 2750 South Twelfth Avenue, Tucson, Arizona, as a special consultant. Keyes will devote himself primarily to the further development of the autoxidation process, a field in which he holds many patents.

Larry Peacock is now president of the Grand Junction (Colorado) Mineralogical Society. Dale Hicks is vice president.

Jack Richardson of Alameda, California, is at Tonopah, Nevada, to do the annual assessment work and perhaps some diamond drilling later on at his Longstreet mine.

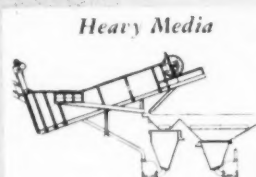
J. C. Hammel of New York has been appointed manager of accounting of Ogleybay, Norton & Company, Cleveland, Ohio. He had been secretary and treasurer of South American Mines Company and affiliates and is a director of Calera Exploration Company, among other jobs.

Anthony F. Benson of Virginia, Minnesota, has resigned as St. Louis County mine inspector after many years of faithful service.

Low Cost Concentration

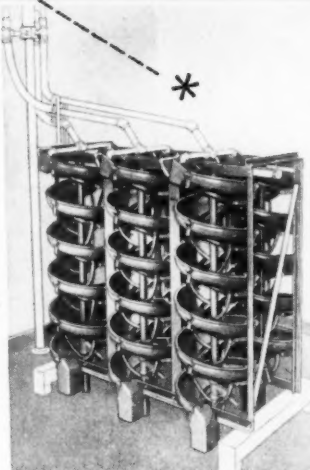
with the

Humphreys Spiral Concentrator



Heavy Media

Bridging the gap between Heavy Media and Flotation, the Humphreys Spiral Concentrator provides a low cost method for recovery of values between $\frac{1}{8}$ " and 200 mesh.

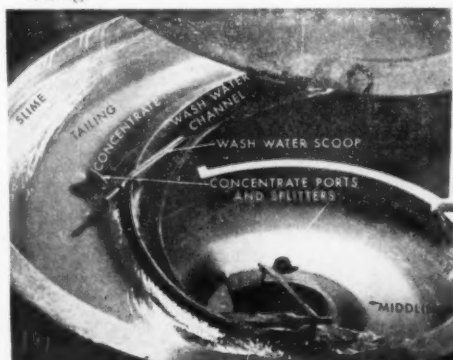


Flotation,

- ★ for separation of minerals of different specific gravity in ores at sizes generally minus 10 mesh.
- ★ for recovery of liberated values too coarse for flotation.
- ★ for recovery of other ore values from flotation tailing.
- ★ for recovery of values too fine to be economically treated by heavy-media separation.
- ★ for cleaning minus $\frac{1}{4}$ inch bituminous or anthracite coal.

Low cost of installation
Low operating costs
No moving parts

Concentrating action of Humphreys Spiral— Note wide black band of concentrate entering upper outlet, which is set for a wide cut, also narrow black band of middling entering lower outlet set for thin cut. In cleaning fine coal, phosphate rock and mica, refuse and middling are discharged from the concentrate ports and cleaned product follows the path shown as tailing.



The installation, operation and maintenance costs of Humphreys Spirals are so low that economical concentration of materials, which could not heretofore be worked at a profit, is now possible. There are no moving parts, no vibration, weight per unit of capacity is low and requires only a light foundation. Floor space per ton treated is very small.

HUMPHREYS SPIRALS are widely used in plant operations in the United States and abroad, ranging from 30 tons to 20,000 tons daily capacity, for concentration of fine iron ore; for concentration of chromite, ilmenite, rutile, and zircon from sands; for concentration of ground ores for recovery of lead, zinc, chromite, copper, barite, mica; for concentration of molybdenum flotation mill tailing for recovery of tungsten; for separation of fine phosphate rock from sand; for cleaning minus $\frac{1}{4}$ inch coal; for concentration of pyrite from flotation mill tailing; for concentration of fine gold and gold bearing minerals.

A testing laboratory is maintained in Denver by the Engineering Division of The Humphreys Investment Company. Results obtainable in a full size plant may be determined by tests of a representative sample of minerals or coal weighing 300-500 pounds.

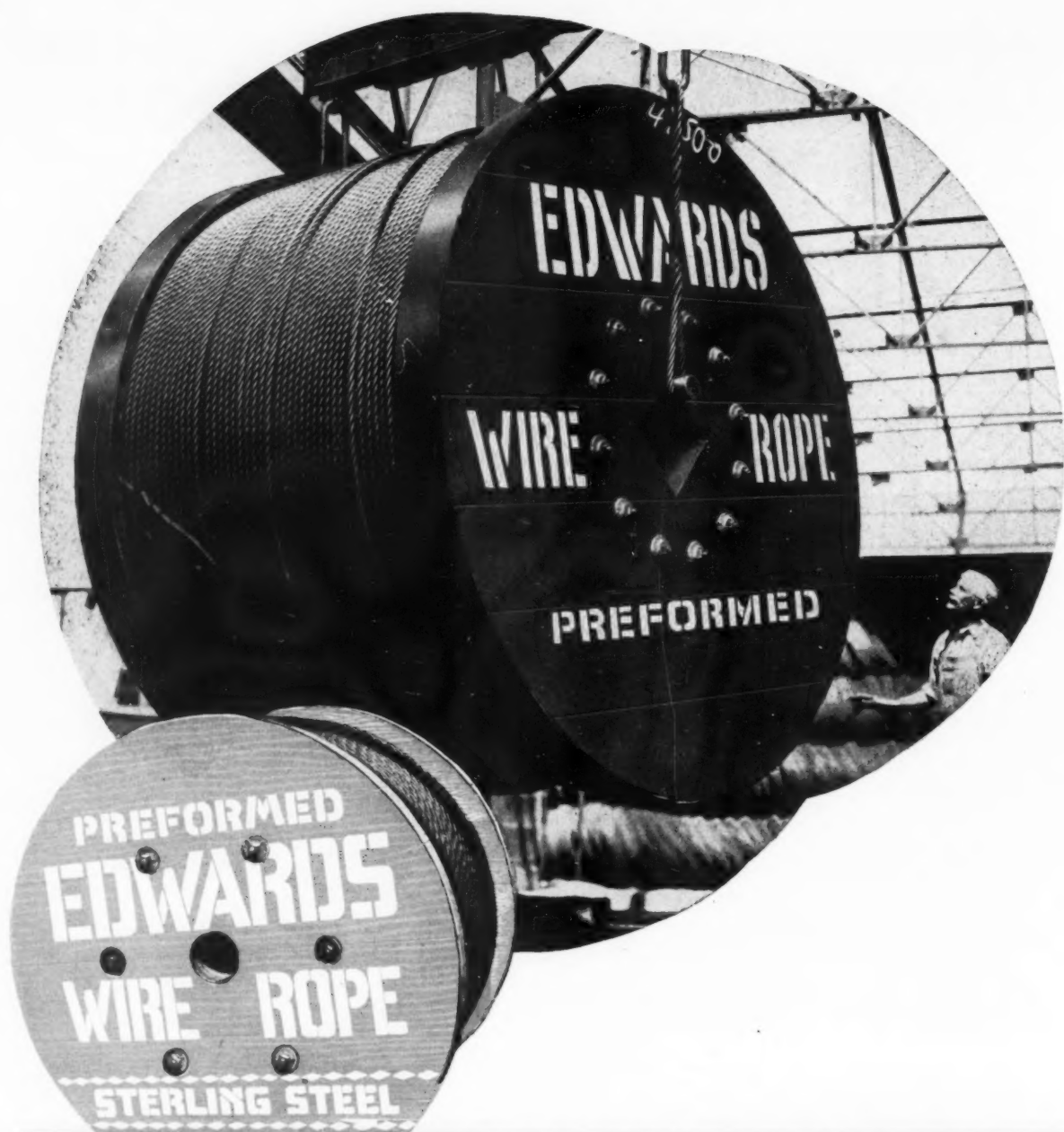
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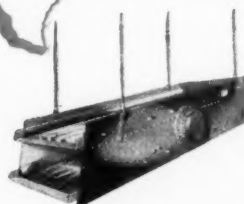
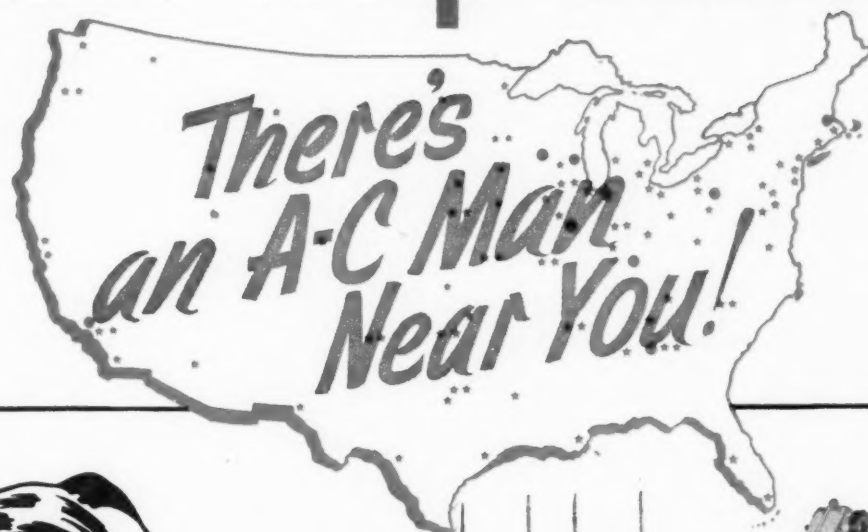
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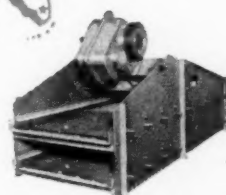
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Kilns, Coolers, Dryers

OCTOBER, 1951

[World Mining Section—3]

31

Here's Tournadozer "time-table"

- Runs .3 to 1.3 miles between jobs
- Cleans up around 2 shovels
- Maintains 2 dumps
- Levels site for washing plant
- Clears truck turn-around areas
- Tows mine equipment

... all in typical 8-hour shift!

7his iron mine on the Mesabi Range near Hibbing, Minnesota, has a lot of clean-up jobs widely scattered over the large pit area, on dumps and along the haul roads. Duration of each job is short . . . usually 10 to 40 minutes working time. Travel distance between jobs varies anywhere from .3 to 1.3 miles. Operating on a fast "work-and-run" schedule, a LeTourneau 19 m.p.h. Tournadozer alternates between 2 stripping shovels and 2 dump areas . . . cleans up spillage, clears truck approaches at the shovels, keeps the dumps leveled. While traveling between jobs, the rubber-tired Tournadozer finds time to clear truck turn-around areas along the haul roads, level a washing plant site, tow shacks, move blasting equipment and handle other odd jobs . . . all in a typical 8-hour shift.

In addition to its fast, "run-about" ability, C Tournadozer has many speed advantages that reduce job time. 19 m.p.h. forward, and 8 m.p.h. reverse speeds, plus 186 h.p., 4-wheel traction, give fast dozing cycles. Instant gear changes with constant-mesh transmission, plus torque converter (optional), and easy electric controls, all add up to more work done with Tournadozer. Your LeTourneau Distributor has more information that will show you how to cut time and costs on your dozer jobs. See him soon.




To prepare for blasting, Tournadozer easily towed shack up 1/10 mile of snow-covered 10% grade . . . pulled cable boat, and helped move shovel and other equipment away from the blast area.

LETOURNEAU
PEORIA, ILLINOIS

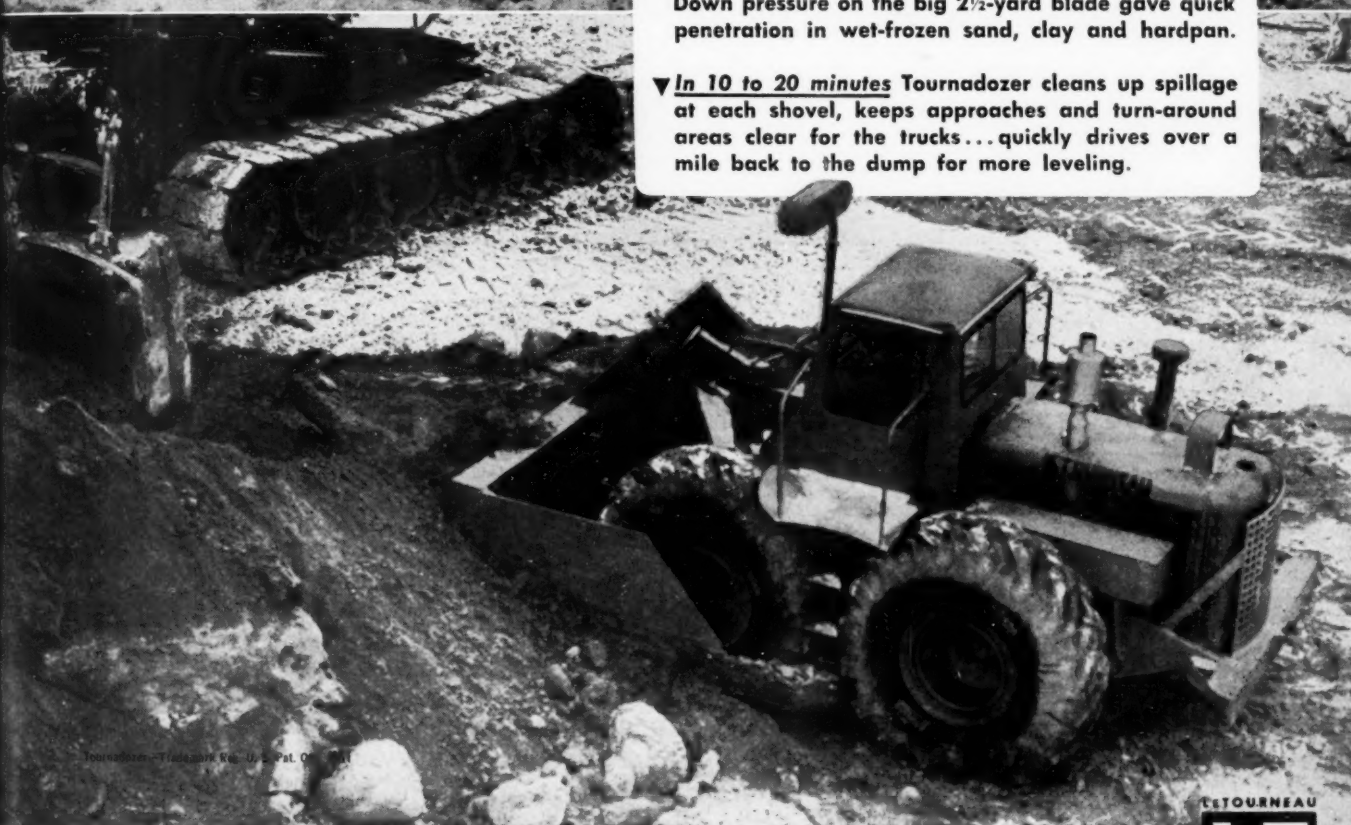


TOURNADOZERS

on Mesabi Iron Range



▲ Several times a day Tournadozer runs to one of the dump areas, works 30 to 40 minutes leveling, dozing spoil over the bank. At time photos were taken, Tournadozer was operating in zero temperatures. Down pressure on the big 2½-yard blade gave quick penetration in wet-frozen sand, clay and hardpan.



▼ In 10 to 20 minutes Tournadozer cleans up spillage at each shovel, keeps approaches and turn-around areas clear for the trucks...quickly drives over a mile back to the dump for more leveling.

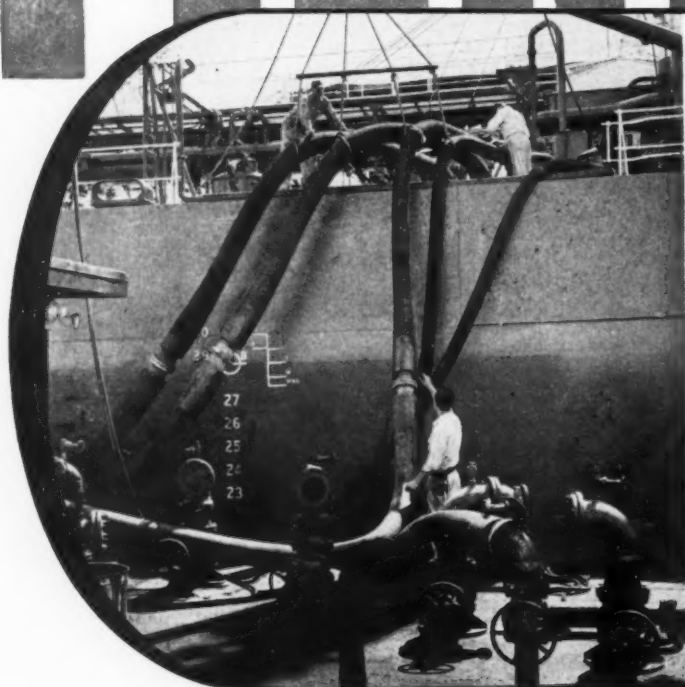
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WORLD MINING

The International Department of MINING WORLD

INTERNATIONAL PANORAMA

MADRID—The General Appropriations Act of 1951, Title I, Chapter 10, (United States) has granted Spain a credit of \$3,200,000 for development of Spanish mineral production.

SANTIAGO, CHILE—The United States government's Export-Import Bank has granted the Corporation de Fomento de la Produccion a credit of \$11,500,000 to expand its steel plants. The company had already received \$48,000,000 from the United States government.

MEXICO CITY—The British Ministry of Materials has purchased 7,500 tons of lead for delivery in late 1951 and early 1952. Prices paid were up to 22.00 cents per pound, Gulf of Mexico port, in contrast to the USA ceiling price of 17.50 cents.

NEW YORK—A world's record for perlite expansion has been established by Great Lakes Carbon Corporation at its Linden, New Jersey plant. The plant has now produced over 2,000,000 four cubic foot bags of expanded perlite aggregate.

RANGOON—The Burmese government has contracted with the New York firm of Knappen Tippetts Abbott Engineering Company for technical assistance for the next two years. The ECA will pay the dollar cost estimated at \$1,500,000. Coal and metal mining are included in the projects to be given assistance.

WASHINGTON—The Office of Price Stabilization has removed the United States price ceiling on manganese, chrome, cobalt, columbite-tantalite, graphite, kyanite, acid grade fluorspar, beryl and asbestos ores.

LISBON—The Economic Cooperation Administration is furnishing \$17,000 to the Mineira Gouveense, Lda. to purchase mining equipment for its tungsten mine at Concelho de Geuvela.

SPARROWS POINT, MARYLAND—A new world's record for pig iron production was made by Bethlehem Steel Corporation's "H" furnace in August. A total of 55,835 tons of pig iron was produced. The furnace operated under normal conditions using ore as a charge.

WASHINGTON—A total of 2,561 United States miners have notified the Federal government of their desire to participate in the government plan to increase tungsten production.

JOPLIN—Production of zinc in the United States in the first six months of 1951 was 348,568 tons—an increase of 19 percent over production in the same 1950 period.

NEW ORLEANS—The largest single sulphur discovery in the world in the last 20 years has been made at Garden Island Bay at the mouth of the Mississippi River. The Freeport Sulphur Company will build a plant to produce 500,000 long tons of sulphur annually and expects to have it in operation in 1953.

LEADVILLE, COLORADO—The uranium bearing mineral, torbernite, has been found in the St. Kevin mining district.

THE HAGUE—World production of tin-in-concentrate for June totalled 13,700 tons compared to 15,600 in May. Production was lower in Bolivia, Belgian Congo, Malaya and Indonesia.

LONDON—A new prospecting and mining syndicate known as the "sulphur exploration syndicate" has been formed to find and develop sulphur sources.

KALISPELL, MONTANA—The Harvey Machine Company has received a DPA approved loan of \$42,000,000 from the Reconstruction Finance Corporation to construct a three line, 54,000 annual ton aluminum reduction plant, and necessary auxiliary facilities.

LA PAZ—An agreement has been reached between the Bolivian tin producers and the Reconstruction Finance Corporation for purchase of Bolivian tin at \$1.12 per pound through October 5, 1951. The tin concentrate will be smelted at Texas City, Texas.

PITTSBURGH—The Weirton Steel Company has placed its new 550-ton open hearth furnace in operation at its Weirton, West Virginia plant. It is one of the world's largest open hearths.

NEW YORK—Production of primary aluminum in the United States during the first six months of 1951 was 807,181,724 pounds. It was the greatest first half year production of aluminum since 1944.

JOHANNESBURG—Exports of pig iron from the Union of South Africa have been stopped in an attempt to supply local needs first.

MEXICO CITY—The United States' Export-Import Bank has granted credits totaling \$56,000,000 to Mexico to improve and modernize the National Railways of Mexico.

NEW YORK—During the first seven months of 1951 a record amount—60,967,903 tons—of steel was produced in the United States. Output was 5,700,000 tons greater than during the same 1950 period.

ST LOUIS—The Aluminum Company of America will enlarge its Mobile, Alabama plant capacity by 180,000 annual tons.

WASHINGTON—Increased export quotas for all types of steel during the last quarter of 1951 have been approved by the United States Commerce Department. Copper and aluminum quotas were reduced.

BOMBAY—The first export shipment of zinc concentrates produced from ore mined in India has been made to Belgium for refining.

WASHINGTON—The General Services Administration has bought 67,654 short ton units of tungsten in the world market. 44,138 units cost more than the U.S. ceiling price of \$65.00 per unit, with the highest price paid being \$70.00 a unit.

PITTSBURGH—The Jones and Laughlin Steel Corporation's program is well advanced to expand iron ore production at its Benson mine in New York by 300,000 tons per year. The plant will recover non-magnetic iron minerals.

MEXICO CITY—All exports of pig iron, copper, lead, zinc and other metals from Mexico must now be licensed by the Ministry of Economy.

WASHINGTON—The International Raw Materials conference with 25 nations members has recommended allocation of all copper and zinc supplies, beginning on October 1, 1951.

Western Division of AMC Sets Date For LA Meet

October 22nd through the 24th are the days scheduled for the meeting of the American Mining Congress in Los Angeles, California, sponsored by the Western Division. Headquarters will be at the Biltmore Hotel, 515 South Olive Street.

A program committee, headed by Ross D. Leisk, general manager, Sunshine Mining Company, Kellogg, Idaho, is arranging special meetings to discuss mining, manpower problems, labor relations, taxation, minerals for security, gold and monetary problems, uranium and atomic energy, rock bolting, milling, smelting and refining.

Entertainment events will be staged at the Biltmore Bowl, and the Cocoanut Grove of the Ambassador Hotel. Field trips to follow the meeting are scheduled to the Crestmore mine of the Riverside Cement Company, The Fontana Works of the Kaiser Steel Corporation, The Irwindale plant of the Consolidated Rock Products Company, Hoover Dam, The Trona plant of the American Potash & Chemical Corporation, Los Angeles Harbor, and the Hancock Oil Company's desulphurization plant.

Harvey S. Mudd, chairman of the Western Division, is making all necessary arrangements.

Copper Mines in U. S. Idled by Strike

On August 27, about 58,000 miners and smelter workers in the United States' copper industry went on strike, idling in turn another 42,000 workers. Some lead and zinc mines also were affected by the walkout, with the result that President Truman urged miners to return to work in these defense-needed industries.

The four big copper producers, Kennecott Copper Corporation, Anaconda Copper Mining Company, American Smelting and Refining Company, and Phelps Dodge Corporation, were the hardest hit by the strike. In Utah Kennecott's Utah mine and refinery and the Magna and Arthur mills were closed. Its Nevada and New Mexico mines also were closed. Production rate at these holdings is a total of 20,000 tons of copper monthly. All of Anaconda's works in Montana were closed—the copper and zinc mines, refineries and smelter—its lead smelter in Utah, and its fabricating plants in Connecticut and New York. Production at these holdings is 9,000 tons of copper monthly. Thirteen of American Smelting's operations closed including refineries, mines and/or smelters in Arizona, California, Colorado, Montana, Nebraska, New Jersey, New Mexico and Washington. Phelps Dodge's Morenci mine and Douglas smelter in Arizona and its refinery in Texas were closed. Production rate at these properties is 20,000 tons of copper monthly.

Kennecott officials finally came to an agreement with union representatives on September 1 and all Kennecott employees have returned to work. A temporary injunction has brought workers in other companies back to work.



The open pit at the "B" orebody of Steep Rock Iron Mines, Ltd., Ontario, Canada. Important expansion in production of iron ore from this district is under way, ore is shipped to the United States.

FOREIGN SOURCES OF IRON ORE

They may supply 30,000,000 annual tons to steel works in USA, enough ore to aid the expanding requirements of the industry

Gold mining has never known a geographical frontier. Iron ore mining, which knew one for years, has now burst its long-existent geographical frontiers in a way that makes the gold rush of 1849 seem insignificant. And, as described elsewhere in this issue, iron mining has also burst its technological frontiers, those connected with the mining and beneficiation of lower-grade ores and taconites.

The necessity of mining foreign iron ores for United States' consumption was recognized before the great depression. Plans for foreign mining projects, shelved during the depression, were brought out again during preparations for World War II. During that war small scattered foreign production resulted from those plans. After the war, and mainly in 1946, 1947 and 1948, iron and steel companies conducted a worldwide search for undeveloped deposits of iron ore which could be cheaply transported to the United States. The search for ore was successful, and today the move to develop foreign sources of iron ore is underway.

By 1955, private industry will have spent nearly \$1,000,000,000 on the various projects. By 1954, all of the projects will probably be in production, and by 1958, the steel industry

of the United States will know the full effect of the foreign ore.

FOREIGN ORE IMPLICATIONS

In general, the foreign sources of iron ore have several things in common, some of which are advantageous and some disadvantageous:

The Advantages. Most of the mines will produce high-grade ore, ore that is high in iron content, low in phosphorus, sulphur, and silica, and often containing some manganese. Deposits are lightly covered with overburden and require only a small amount of stripping for initial production. Great ore reserves will result in long life, even though rates of production will be high.

The Disadvantages. Most of the deposits are in wild or inaccessible country. Developing them will require and is requiring the expenditure of millions of dollars for sea and rail transport facilities, for new communities, in addition to the actual mining equipment. Cheap power is generally not available to the operations. In some instances, operations are vulnerable to changing policies of foreign governments; also the systems of ore transport on the open sea are vulnerable to enemy attack during wartime.

[World Mining Section—8]

FOREIGN DEVELOPMENTS

The following is a brief resume of the major foreign developments that will contribute iron ore to the United States:

Algeria

La Societe de L'Ouenza. The Bou Kadra and Ouenza mines furnished about 3,000,000 tons of ore for export in 1938. Destroyed during the war, facilities are being rebuilt to provide for sustained export at the rate of 2,500,000 annual tons, and for loading of ships at the rate of 1,000 tons per hour from the port of Bone.

Brazil

Itabira Iron Ore Co. This company, operated by Cia. do Rio Doce, operates the Caue Peak mine, and has for the past 10 years exported high-grade iron ore through the port of Vitoria. A major bottleneck, the railroad from Caue Peak to Vitoria, is being corrected. Export of about 700,000 tons in 1950 should be more than doubled by 1952, and, if presently considered plans are completed, the export tonnage will be much greater. Potential reserves are large; they have been estimated at 1,000,000,000 tons; a formal United States Geologic Survey report may soon be available.

MINING WORLD

United States Iron Ore Imports in Gross Tons by Countries of Origin for 1949, 1950, and First Six Months of 1951

Country	1949	1950	Six Months of 1951 Through June
Algeria	415,501	494,342	346,913
Brazil	354,509	689,304	424,647
British W. Africa	59,548	183,261	137,915
Canada	1,603,106	1,833,262	897,740
Chile	2,627,000	2,569,980	1,435,205
Cuba	11,589	29,000	
Liberia			10,050
Mexico	169,823	190,958	83,259
Sweden	2,047,343	2,037,249	1,267,066
Tunis	82,815	119,093	88,250
Venezuela			197,158
Others	30,923	47,531	79,728
TOTAL	7,402,157	8,193,980	4,667,931

Canada

Algoma Ore Properties, Ltd. Algoma has 11 of the 15 known productive miles of the Michipicoten range of Ontario, and also has great untapped reserves in the Goulais range, 50 miles northeast of Sault Ste. Marie. Algoma's ore, mainly siderite that is low in iron and high in silica, is beneficiated by HMS and sintering to produce a highly desirable product which contains about 52.0 percent iron and 3.0 percent manganese. Recent addition of a fourth sintering unit, and recent conversion of the Victoria to underground (block-caving) production have brought Algoma's capacity to nearly 1,500,000 annual tons of sinter.

Dominion Wabana Ore, Ltd. This company operates the Wabana mine, actually four separate but integrated mines, off Bell Island on the southeast coast of Newfoundland. Mine mechanization will boost ore production to about 1,700,000 tons for 1951, and to 2,500,000 tons by 1952; of the 1952 production, 1,700,000 tons will be exported. Little of this high phosphorus ore (0.85 percent) has reached the United States so far, but greater amounts will be shipped in the future.

Iron Ore Company of Canada. This company was formed to operate the Labrador holdings of Labrador Mining and Exploration Company, and the Quebec holdings of Hollinger North Shore Exploration Company, Ltd. Five United States steel companies are directly interested in Iron Ore Company of Canada and its properties near Knob Lake: Republic Steel Corporation; National Steel Corporation; Armco Steel Corporation; Wheeling Steel Corporation; and Youngstown Sheet and Tube Company. The M. A. Hanna Company and Hollinger Consolidated Gold Mines, Ltd. control large interests in the operation as a result of discovery, early exploration, development, and investment.

The Labrador-Quebec concessions cover a deeply eroded trough, the Ungava or Labrador trough about 50 miles wide and 300 long. In January 1950, after exploring five percent of the favorable area not covered by overburden, 358,000,000

tons of ore had been developed; by 1951, the figure had been expanded to 417,000,000. Ore is in several deep lens-shaped deposits of hard hematite. Deposits will be mined to make three ore grades available: Pure non-Bessemer ore which contains about 60 percent iron and amounted to about 58 percent of the January 1950 proven reserves; non-Bessemer ore which contains about 58 percent iron and 0.10 phosphorus and amounted to about 30 percent of the January 1950 reserves; manganiferous ore which contains about 50 percent iron and 8.0 percent manganese and amounted to about 12 percent of the January 1950 reserves.

Iron Ore Company is now building a 360 mile railroad from Knob Lake to Seven Island, Quebec on the St. Lawrence River. Prospecting, exploration, and camp construction at Knob Lake are being pushed

for 2,000,000-ton production in 1954, production of 5,000,000 tons in 1955, production of 10,000,000 in 1956 or 1957, and possible later production of 20,000,000 tons. Ore will go by ship from Seven Islands to Atlantic ports; one sure customer, in addition to the five steel companies which are financing the project, is Bethlehem Steel Corporation, which signed a contract providing for purchase of 30,000,000 tons over a period of 25 years.

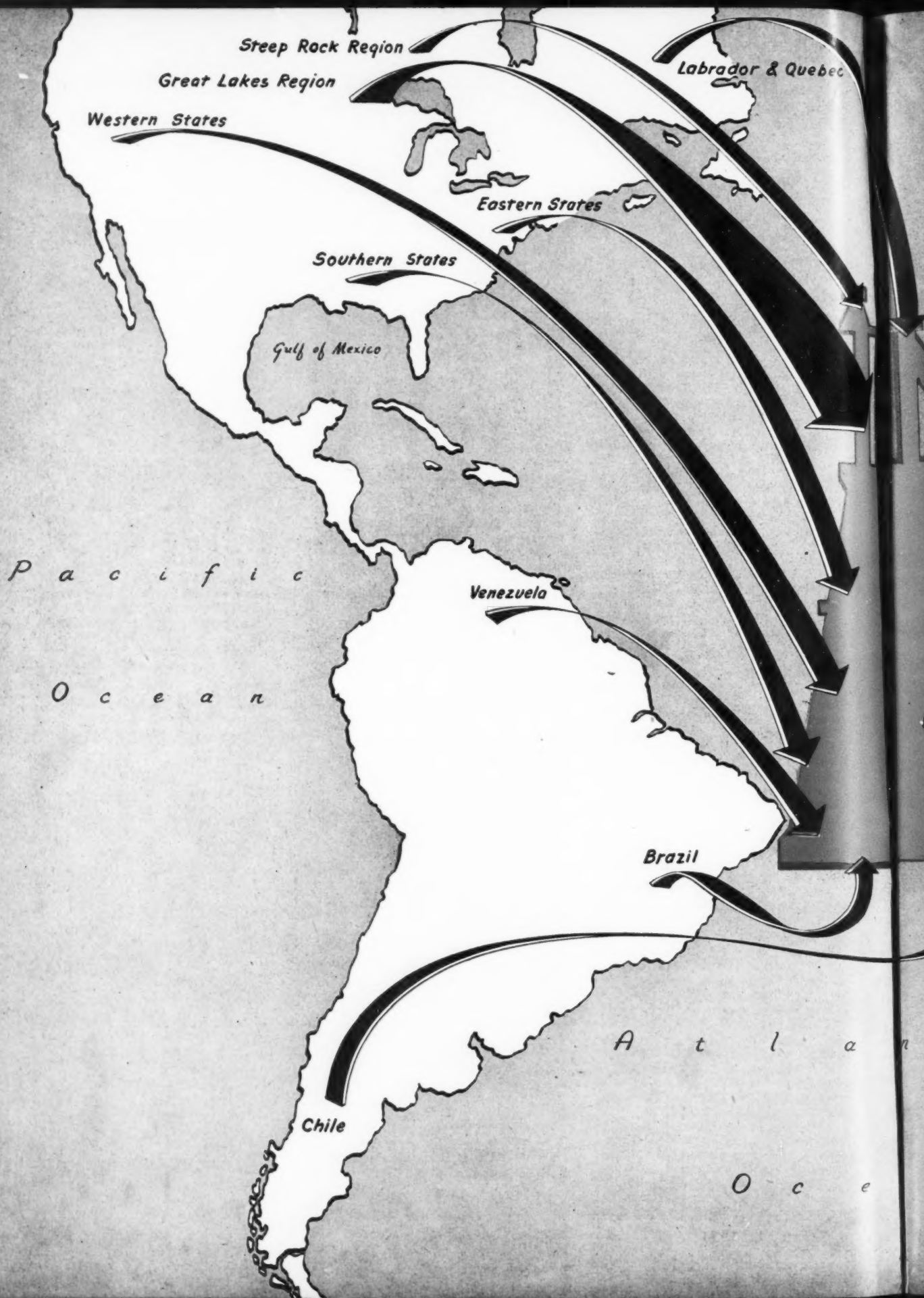
Railroad construction will be finished in 1953. By the end of 1951 more than 100 miles of grading will be finished. Seven Island docks are being designed and will be finished in two years.

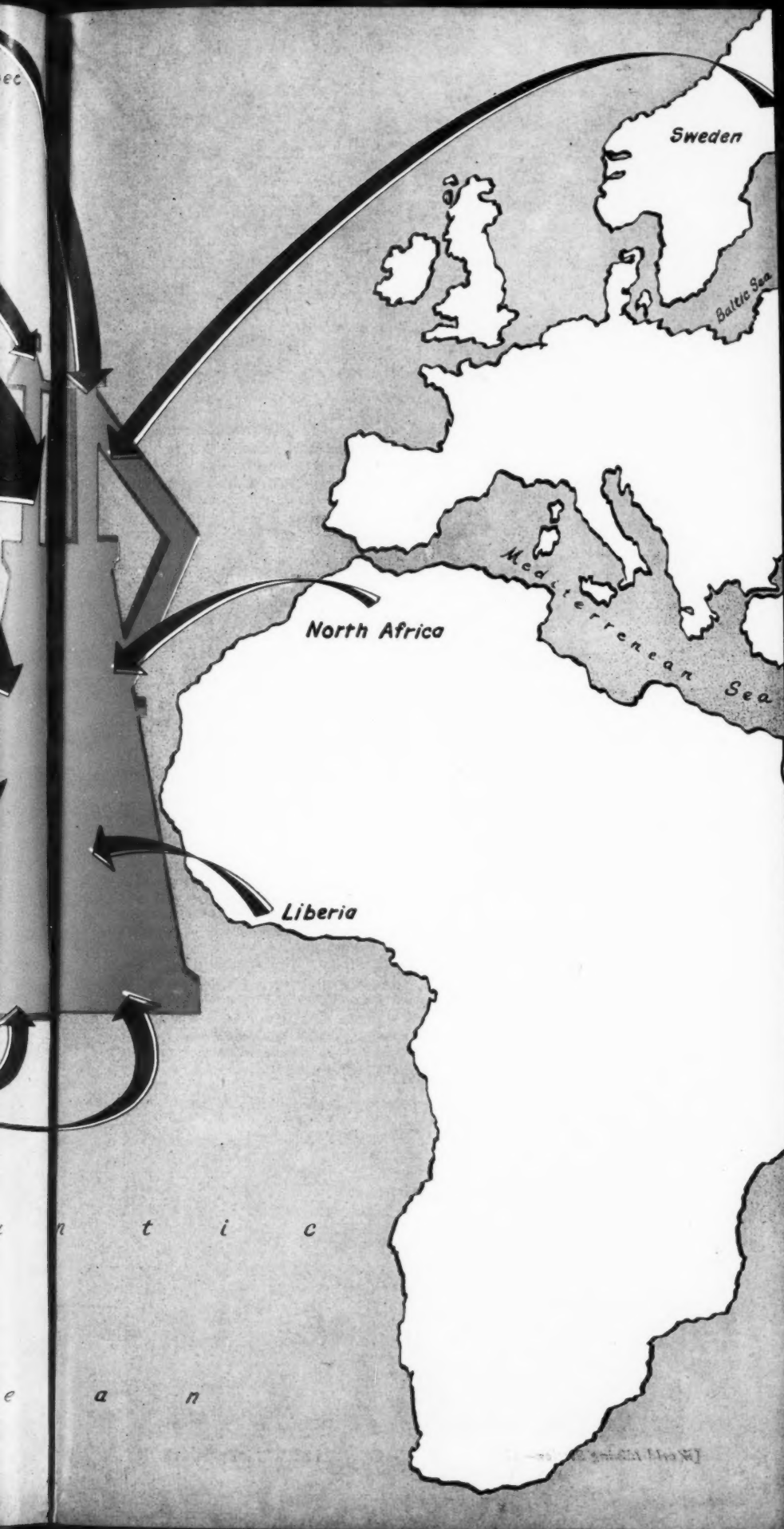
Marmoraton Company. This Bethlehem Steel Corporation subsidiary is developing a replacement deposit of magnetite ore in Pre-Cambrian limestone at Marmora, 30 miles north of Trenton in eastern Ontario. Bethlehem has drilled the deposit since 1949, and the recently formed Marmoraton Company is now stripping a 150-foot-thick cap of barren flat laying Paleozoic limestone, intends to complete the stripping by 1953.

Drilling has not completely outlined the limits of the orebody, and no accurate estimate of the tonnage present can be made. The grade of the ore ranges from some stringers and irregular masses of magnetite to country rock with only a small percentage of magnetite. The ore will have to be crushed and milled in or-

The Bethlehem Chile Iron Mines Company ships large tonnages of ore from its El Tofo mine, pictured here, at La Serena, Chile to Sparrows Point, Maryland.







**PRESENT
and
FUTURE
SOURCES
of
IRON ORE
for the
EXPANDING
U. S. STEEL
INDUSTRY**

der to bring it up to a grade suitable for blast furnace use.

The concentrate will be transported to Lake Ontario by rail and loaded into barges for lake shipment to Bethlehem's Lackawanna plant at Lackawanna, New York.

Steep Rock Iron Mines, Ltd. This company was formed in 1939, proved 25,000,000 tons of ore by 1943, went into production in 1944, and produced 1,216,614 export tons in 1950. Steep Rock Lake, 142 miles northwest of Port Arthur, Ontario, originally covered most of the deposits. The first phase of "stripping" consisted of damming and diverting the Seine river which fed the lake, pumping out enough of the remainder to provide room for the Errington pit in the "A" orebody, the first and only present producer.

Now worked by the Errington pit, the "B" orebody is being prepared for sustained underground production of 1,500,000 annual tons. First underground ore probably will be produced in 1952 from above the 400 level. Errington underground will be worked by block caving, with ore hoisting, even from great depths, accomplished by zig-zag conveyor slopes.

The "A" orebody is now being dredged to remove 40,000,000 to 50,000,000 yards of overlying silt, and the resulting Hogarth open pit is scheduled for production in 1953 of 2,000,000 annual tons, and eventual production of 3,000,000 to 4,000,000 annual tons. So by 1954, from the "A" and the "B" orebodies, Steep Rock may be producing from 2,500,000 to 3,500,000 annual tons. Reserves in May 1948 were stated at 72,000,000 tons. Recent unofficial reserve figures have varied between 200,000,000 and 1,500,000,000 tons. Ore produced to date has been classified in two grades: Seine River, 57.5 percent iron; negligible phosphorous and sulphur; Steep Rock Lump, 60.0 percent iron, 0.25 phosphorous.

Inland Steel Company. This company's subsidiary, Caland Ore Company, has leased 800 acres of Steep Rock's "C" orebody, and is conducting an extensive program of diamond drilling. The drilling is being done under water to depths of 750 to 1,000 feet in places. Considerable ore tonnages are said to have been proved in this promising orebody. One unofficial source states 100,000,000 proven tons. Drilling is being continued and Inland's engineers are evaluating results.

Pickands Mather & Company. This company, representing itself, Bethlehem Steel Corporation, Youngstown Sheet and Tube Company, Dalton Ore Company, Interlake Iron Corporation, and The Steel Company of Canada, Ltd., acquired an option to 1,000 acres of Steep Rock's holdings in a favorable area south of the "C" orebody. No results have been announced.

Chile

Bethlehem Chile Iron Mines Company. The Bethlehem subsidiary has one producing mine, the El Tofo mine which shipped 271,140 tons in May and 222,824 tons in June 1951. The new El Romeral mines, northeast of La Serena is being prepared for production after completion of rail facilities from El Romeral to Guayacan and port facilities at Guayacan. El Tofo has reserves estimated at 85,000,000 tons; El Romeral 18,000,000. Total export production from both should easily be 3,000,000 to 5,000,000 tons by 1954, up from the 1950 level of 2,600,000 tons produced from El Tofo.

Liberia

Liberia, on the underside of Africa's western hump, has been the scene of one of the most interesting and exemplary foreign ore developments in many years. In 1946, Landsdell Christie, President of Liberia Mining Company, took up where a Holland Syndicate had left off in

1937 and launched plans for bringing to usefulness the massive high grade magnetite deposits of Bomihills, 45 miles north of Monrovia. After completion of the mining and railroad survey work, Christie was successful in interesting Republic Steel Corporation in the venture and last year a \$2,000,000 railroad was spearing northward through the dense jungle. In June of this year Liberia's first shipment reached the United States. Assays show, 69 percent iron, less than 1.5 percent silica, 0.07 to 0.08 percent phosphorous and 0.03 to 0.04 percent sulfur.

Minimum estimates of proven ore reserves are 24,000,000 tons of high grade in the primary deposit, which juts up perpendicularly and accessibly some 120 feet above the surface. Over 5,000,000 tons of high grade float litters the slope, enough for nearly four years' output at the currently scheduled rate. The operation was visited in June by one of the staff of *Mining World* who reports that further drilling will undoubtedly greatly expand reserves.

Adjoining deposits, not included in current estimates, will eventually yield large additional tonnages of excellent grade ore. From 75,000,000 to 150,000,000 tons of lower grade ore (above 42 percent) are available in the same area. With the end of the wet season production will hit a rate of 1,000,000 tons annually by November, and the company is now planning to increase this by 50 percent next year. Total investment in the project is about \$11,000,000, \$4,000,000 of which was provided by an Export-Import Bank loan.

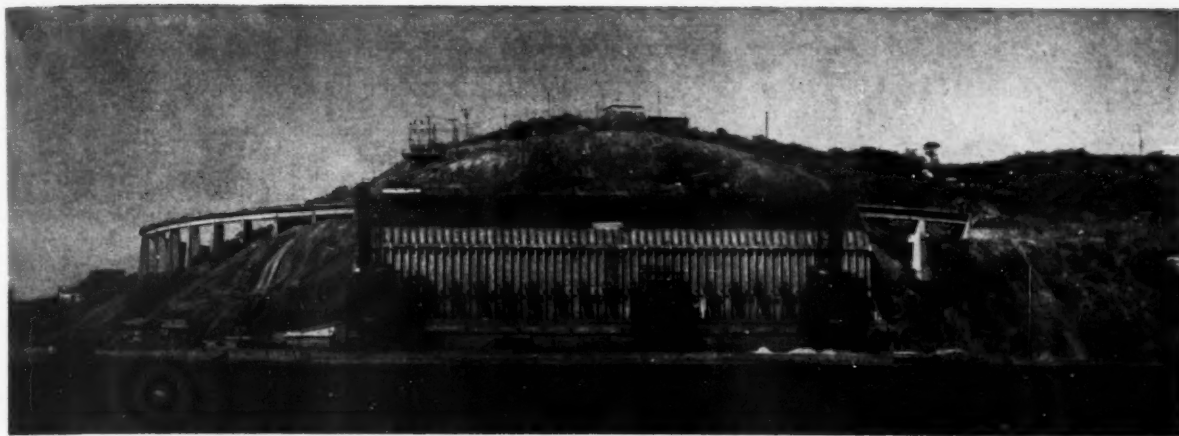
Puerto Rico

The newest source of foreign ore for United States' steel furnaces is the West Indies Mining Corporation operating the Keystone mine in the Hunkas district, Puerto Rico. The corporation was formed and is directed by experienced Minnesota

LEFT: A back hoe trenches through the thin overburden at one of the hematite deposits of the Iron Ore Company of Canada near Burnt Creek, Labrador. The diamond drill in the background will determine the thickness of the ore. RIGHT: A view of the Quebec North Shore and Labrador Railway Company's right of way along the Moisie River between Seven Islands and Knob Lake, Quebec, Canada. First ore from the Labrador-Quebec deposits is scheduled for shipment over this railway in 1954.

Photographs by International Harvester Co.





Ocean iron ore carrier loading docks at Vitoria, Espirito Santo, Brazil. All ore exported from the Itabira district, Minas Gerais is loaded here.

iron miners. Regular shipments of high grade, minus-5-inch and plus- $\frac{1}{2}$ -inch, 62 percent iron ore for open hearth charging are being made to the Barium Steel Corporation. Two other open pit mines may be opened and prospecting of other deposits is under way. Shipments scheduled for 1951 are 120,000 tons and 250,000 tons in 1952.

Sweden

Sweden's 1950 production of 14,000,000 tons came mainly from the Kiruna and Malmberget deposits. Imports to the United States were about 2,000,000 tons of high-grade magnetite. Production for Swedish and foreign use is being increased; United States' share will increase accordingly.

Venezuela

Iron Mines Company of Venezuela. This Bethlehem Steel Corporation subsidiary shipped its first ore from the El Pao mine in 1951; the shipment arrived March 21 at Sparrows Point, Maryland. Development of El Pao started in 1941. The deposits, about 2,600 feet long, 1,700 feet wide, and varying in thickness to 400 feet, is generally assumed to have proven reserves of approximately 70,000,000 tons of hard, lumpy, 63-to-66 percent iron (hematite) ore. The mine, starting as an open cut, will eventually be a true pit with sump. Ore is hauled by rail from El Pao to Puerto de Hierro, 39 miles distant, is loaded into barges and later reloaded to ocean carriers for shipment to Sparrows Point. A production rate of 3,000,000 tons should be reached in 1952 or 1953.

Orinoco Mining Company. This United States Steel Corporation subsidiary discovered a huge deposit of hematite at La Parida in 1947. The mountain, now renamed Cerro Bolivar, is capped by an orebody about four miles long, up to two-thirds of a mile wide and averaging 230 feet in thickness. Recent figures indicate 415,000,000 proven tons,

probable reserves of more than 1,000,000,000 tons, and a grade of 63.50 percent iron (ignited). Ore as mined will run better than 57 percent iron; phosphorus content is slightly high (0.106 percent). The orebody is now being developed for a production of 1,000,000 annual tons by late 1953. Development is about 10 percent completed, and consists of building a 90 mile railroad to Puerto Caroni, improvement of the Macareo and Orinoco rivers for a distance of 175 miles, equipment of towns, mining plant, and railroad equipment, and acquisition of sea-going ore carriers.

RESULTS OF RICHER ORE

By 1954, all of the projects will probably be in production. By 1955, private industry will have spent nearly \$1,000,000,000 on the various projects, and by 1958, the steel industry of the United States will

know the full effect of the new foreign ore.

To a great extent, the expansions which take place after 1954 will depend on the relative cost of foreign ores as compared to beneficiated ores or taconites from the United States. One most important thing about the foreign ores is that they are rich; the average iron content will approximate 60 percent. That richness could be used in either of two ways; First, each ton of 60 percent ore could be blended with one ton of low-grade (say 40 to 49 percent) domestic ore, and the resulting furnace charge would be of better grade than the present U. S. average. Second, if the foreign ores are not diluted but are charged directly, the steel industry, by making minor plant revisions, will find itself with more capacity than it had expected. Either effect is, like the prospect of the foreign ore itself, both assuring and insuring.

Steel production facilities are being built at a record rate. The Nos. 1 and 2 blast furnaces, with the three stoves (center) are being built at the United States Steel Corporation's Fairless Works, Morrisville, Pennsylvania, and will use imported ores.





The Genoa mine of the E. W. Coons Company near Hibbing, Minnesota. Mobile, high-speed, Diesel-powered, mechanized equipment sets the standard for iron ore mining.

THE IRON ORE MINERS ARE READY

Experienced men, larger equipment and the opening of new mines will supply all the ore the steel industry needs

This is the busiest season in the long history of iron ore mining on the Lake Superior iron ranges. Twenty four hours a day, seven days a week, the roar of Diesel's sounds over northern Minnesota and smoke rises high into the sky as ore trains spiral out of deep pits and trucks climb with their 30-ton loads to the tops of the ever-growing waste dumps. New headframes rising along the Michigan ranges mean new and deeper mines and more iron ore for defense and industry.

RECORD SHIPMENTS

The all-time record for shipments, by ore carrier, of Lake Superior district iron ore was about 92,000,000 tons and was established in 1942. Apparently, the record will not be bettered this year, but there is a good chance—providing favorable weather holds into December—that the peacetime high of 84,693,010 tons shipped in 1948 will be exceeded. The combined Lake movement and the all-time high, 8,000,000 ton, all-rail movement may reach 96,000,000 tons for a new record for total shipments.

MORE WORK FOR ORE

Iron ore miners are now working harder and faster to ship one ton of ore than ever before. Larger, faster and more mobile equipment is being used. The stripping ratio is

constantly going up, and in some instances four tons of overburden and 10 tons of water have been removed to make one ton of ore available for mining. Congested areas, problems of ownership, and thicker overburden necessitate moving waste greater distances and/or to the tops of rapidly heightening dumps. In some instances old waste dumps are being moved to get to what now is ore, but was only mineralized rock when the original dumps were built. Today's deeper pits require more work to elevate the ore to surface level.

The problems of maintaining grade from many pits means the mining and washing of larger tonnages in order to ship the necessary iron units.

More oxidized taconite and "paint rock" are being drill blasted, loaded and hauled out of the pits to make direct-shipping and wash ores available.

Many companies are now stripping overburden and mining ore simultaneously from the same pit. Formerly waste was stripped only during the winter months, and the same equipment was used for ore mining during summer.

A large portion of any discussion of iron ore mining, will logically, be most descriptive of open pit mining. Justifiably so when the 1950 production figures for the most important iron ore mining county in the United States—St. Louis County, Minnesota—are analyzed. In that

county in 1950, 74 open pits yielded 45,498,990 tons of ore and 10 underground mines 3,172,976 tons. A total of 52,686,635 cubic yards of overburden and rock was removed to mine the open pit ore.

The mining companies, their technical staffs and skilled workmen are meeting the challenge for more iron units by long-range planning, increased mechanization, beneficiation of lower grade ores, the desire to improve existing methods and above all the desire to develop new equipment and processes.

STRIPPING

The greatest advance in stripping methods with a corresponding lowering of costs in recent years has been achieved by the successful application of large walking draglines feeding a conveyor-belt, transportation-stacker system through a mobile, surge-bin, screening plant.

The first and largest installation of this type was placed in operation in May 1948 at the South Agnew mine of the South Agnew Mining Company (The M. A. Hanna Company, operating agent). After successfully stripping the South Agnew mine, the dragline unit is now stripping 35,000,000 cubic yards of overburden to an average depth of 180 feet at the nearby Morton mine. Using a specially designed bucket of 30-yard capacity, in which three-inch-diameter holes were punched in the sides and back to lighten the

weight and allow water to flow out, the unit has dug and transported to a dump two miles away as much as 1,250,000 cubic yards of overburden per month. In one cut the dragline has successfully dug to a depth of 110 feet from a very wet pit in which large bodies of quicksand made conventional shovel stripping impractical during the summer months.

Large boulders, too big to be economically separated out by the screening plant, are cast aside on the pit bottom and subsequently loaded into trucks by a shovel during the winter freeze up. Boulder oversize, plus-9-inches, from the screening plant is trucked to the waste dump.

Smaller (11-yard) but similar dragline conveyor-belt units have been used by the Oliver Iron Mining Company at its Gross-Marble mine, the Canisteo mine of the Cleveland-Cliffs Iron Company, and by the M. A. Hanna Company at various mines on the Cuyuna Range.

One limitation of this type of stripping in contrast to truck- or rail-shovel stripping is the fact that cold weather freezes material to the belts and limits operation to only about seven months of the year. The system is not feasible for rock stripping.

RAILROAD STRIPPING

For large pits, particularly those in areas where close yet adequate dump ground is unobtainable for any of several reasons, rail stripping of both overburden and rock is the cheapest. Once loaded, waste is easily and cheaply transported several miles, if necessary, to dumps well outside the area of any possible future mining.

SHOVEL-TRUCK STRIPPING

The development and use of larger trucks has appreciably reduced the cost of shovel-truck stripping. The system is flexible: operations can be started quickly and easily changed; small irregular areas can be stripped; all-year operation is possible; there is easy and clean segregation of ore, waste and low-grade ore; and waste can be piled to greater heights in confined areas. Large boulder- and clay-bed removal are routine by this system whereas they both cause trouble on conveyor belts. The system continues to be the most widely used on the ranges and will undoubtedly hold the position.

In a pit with some quicksand and a soft bottom the use of trucks and shovels was possible only after establishing a pump sump and a series of inleading drainage ditches. Even after a good deal of drainage,

"block-and-block" loading is necessary, with rubber-tired trucks operating on the higher, water-drained bank. End-dump trucks are preferred because larger boulders can be handled. At two separate stripping jobs, moving approximately the same yardage, the operation which used some bottom-dump, semi-trailer wagons required one extra bulldozer to level and maintain the waste dump.

SCRAPERS

The presence of large boulders in the glacial overburden precludes the extensive use of self-loading scrapers. At one open pit an old waste dump from an underground mine was successfully loaded and moved out of the area by scraper equipment.

LAKE-BED STRIPPING

Several open pits have been developed in the beds of former lakes. Careful diversion of the lake's inlet stream and dike construction around the pit's periphery successfully prevented water inflow. Black mud on the lake bottom was bailed into bottom dump trucks or mixed

with the overburden for easier handling. Freezing of the mud facilitated its loading and trucking.

Pickands, Mather & Company successfully stripped surface material from the bottom of Rabbitt Lake on the Cuyuna Range, Crosby, Minnesota with a dredge. The dredge, floating on the lake, pumped material from the lake bottom to waste disposal areas on shore through a large diameter steel pipe line.

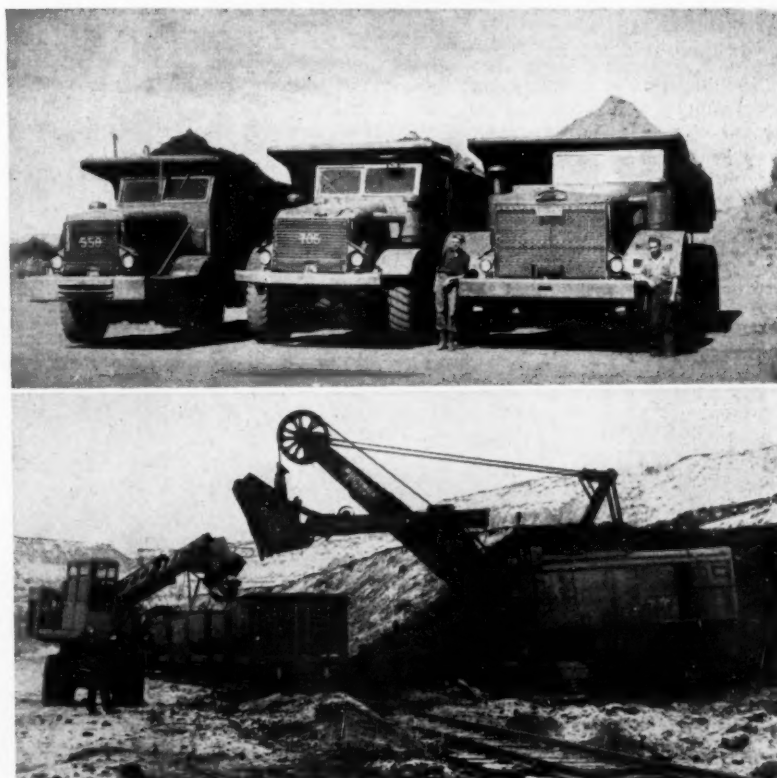
DRILLING

Electrically driven, crawler-mounted churn drills are used for the majority of blast hole drilling in the open pits. The trend toward larger holes (nine-inch-diameter) continues. As harder rock is drilled and the rock-to-ore stripping ratio increases operators and research engineers have tried other methods of making hole and have developed at least one new process—jet-piercing—for penetrating rock.

Auger Drilling

The Mary Ellen mine of the Stanley Mining Company near Biwabik, Minnesota has successfully used an auger drill, 6½ inches in diameter, powered by a 59-hp water-cooled gasoline engine to drill

TOP: How big can trucks get??? From left to right; 20-, 30- and 50-ton-capacity trucks. The 50-ton truck is an experimental model now being field-tested at the South Agnew mine, M. A. Hanna Company, agent, near Hibbing, Minnesota. The truck is equipped with semi-automatic transmissions and booster steering. **BOTTOM:** As iron ore is loaded for winter all-rail shipment, calcium chloride is added to prevent the ore from freezing in the cars. The picture shows loading operations at the Monroe open pit mine of the Oliver Iron Mining Company near Chisholm, Minnesota.



slightly inclined holes to a depth of 40 feet. Holes are drilled in the soft stratum below a hard silicious taconite capping up to 15 feet thick. Drilling of vertical (down) holes through the capping is economically impossible.

Quarry Master

A quarry-master drill is used at the Mesabi Chief open pit mine of The M. A. Hanna Company at Nashwauk, Minnesota for drilling vertical blast holes.

JET-PIERCING

The newest yet oldest method of rock penetration—the application of heat to crack a rock surface—which was used by the early Egyptians is playing an increasingly important part in lowering mining costs.

The Linde Air Products Company has developed a jet-piercing machine. In making a blast hole, jet-piercing utilizes thermal energy instead of the mechanical energy used in percussion drilling.

Increasing field experience and the improvements in the piercing machine and operational procedures has continually lowered the cost of broken rock in front of the shovel.

Jet-piercing has been described by Robert B. Aitchison, Development Department of the Linde Air Products Company, as follows:

"Jet-piercing is a term used to describe a certain type of flame process used to pierce a blast hole in ore or rock. If oxygen and a fuel such as kerosene are conveyed separately at very high pressure to a specially designed chamber and there burned, the resultant combustion will be very violent. If an exit were not provided an explosion would take place. This principle is used in rockets, the prime difference being that in jet-piercing use is made of the flame and the speed of that flame, while common uses of rocket motors employ thrust as a

propulsion medium. The jet-piercing flame is a myriad of high-speed, flying cutting edges that never grow dull.

"Temperature is important but equally so is the velocity of the jet-piercing flame. This speed has been accurately investigated and found to be in the neighborhood of 6,500 feet per second. The jet-piercing flame is in very truth a disintegrator when it encounters magnetic taconite. The rock does not melt. It never gets time to fuse. Instead in the solid rock directly in the path of the flame there sinks a hole almost as rapidly as the eye can follow. A cloud of particles of rock, some as large as one's thumb, some smaller than ordinary table salt, are flung out of the cavity being produced. At the start of the operation, this ejection of particles may throw these small pieces 20 to 25 feet. During this time the whole blowpipe, perhaps 38 feet long, has been revolving—which produces a roundness of hole suitable for easy loading with explosive. At the same time the cooling water which keeps the combustion chamber from melting is allowed to escape at the bottom of the nozzle through a multiplicity of ejection ports drilled around the periphery. Thus some fine streams of water are seen. Some of these directly bathe protruding teeth ends attached to a steel shell. This device sizes the hole and knocks off any bits that might wish to cling to the walls of the hole. The hole rapidly increases in size and depth, and within perhaps two minutes the operator throws the control that starts the blowpipe on its downward journey. The piercing action goes on steadily and soon the full depth of 30 to 31 feet is reached. Then the flame is extinguished and the blowpipe comes up and out at high speed. The giant machine then moves over the ground another 18 to 20 feet and within 10 or 15 minutes another hole is being sunk."

A JPM-1 (Jet Piercing Model 1), first commercial machine developed by Linde, is in operation at the Erie Mining Company. This machine burns a 6½ inch hole. A similar machine designed to pierce a 7½ inch hole is now on order and being built for Reserve Mining Company of Babbitt, Minnesota. Cost of JPM-1 is in the \$100,000-dollar and upward bracket complete with oxygen, fuel and pumping equipment.

Erie Mining Company has conducted extensive experiments with the 6½ inch holes and the JPM-1 machine. A recent piercing record was established by the drilling of five holes 31 feet deep in a single eight hour shift. This averages about 20 feet per hour. The best one week average to date has been 112 feet per eight hour shift.

Experimentation has shown that a 6½-inch blast hole can be burner-reamed to 9½ inch in a rather simple manner. Six-inch hole has been enlarged to 7½-inch hole at the rate of 40 feet per hour. A 7½-inch hole can be enlarged to 9½ inches (this is a one-inch ream all around) at about 40 feet per minute. The current practice in drilling has been to drill a double row of holes on 17-foot centers—the holes are 17 feet from the bank and the second row 34 feet from the bank, holes are on 17-foot centers in each row and the rows are so placed as to stagger the holes along the bank. They are drilled in this manner for convenience and very often are loaded and left to stand while a single row or part of a single row is blasted. In full-scale commercial operations, that both rows of holes would be shot at the same time is likely.

BLASTING

Refinements in the methods of initiating and propagating blasts have improved fragmentation and have lowered costs in the open pits in recent years.

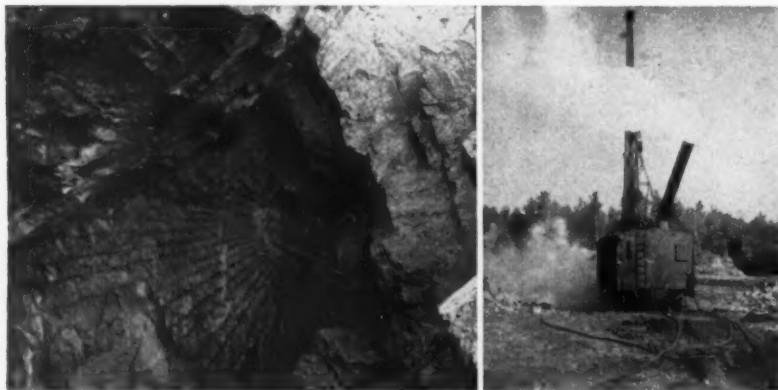
Plastic, reinforced primacord is widely used in churn-drill holes because of its toughness, flexibility, high tensile strength and ease of handling.

The use of split-second-delay blasting caps has increased because of the need to minimize vibrations near towns. The caps' use in the winter blasting of frozen overburden is also important to reduce the shock wave, which travels fastest along the frozen surface and transmits the shock to building foundations.

A special Primacord "booster" has been developed for setting off Primacord which has become wet in holes loaded and left for a long period before firing. The booster is placed between the newly laid dry-running lead and the blasting lead from each hole.

The latest improvement in blast-

LEFT: Hole pattern for a radial-blast-hole-drilling stoping method is clearly shown after the round has been blasted at the Clifton mine of the Hanna Coal & Ore Corporation, DeGrasse, New York. RIGHT: The JPM-1, jet-piercing machine in operation at the Erie Mining Company, Aurora, Minnesota. This machine has pierced as high as five 31-foot-deep, 6½-inch-diameter holes in an eight-hour shift.



ing has been the use of DuPont Primacord "MS" Connectors. They are safe and permit unlimited flexibility in sequential blasting. Each connector contains a delay element of 16 to 17 milliseconds. Connectors can be used in multiple drill patterns for sequential firing of either individual holes or groups of holes. The short interval tends to prevent cutting off of holes by an earlier blast. The connectors can be connected in series to give any desired delay period.

BLASTING AGENT

A new blasting agent is reportedly under development for possible blasting of magnetic taconite. It is formed in the shape of 1/4-inch "nuggets," is free running, has a high velocity and is indestructible in water. The nuggets are poured into vertical drill holes to fill the voids between the packaged ammodyn powder and the rock.

The use of Nitramon and Nitramex packaged in metal containers which can not be detonated by sparks has permitted safe loading of long horizontal holes by the same machine which drilled the hole.

Secondary blasting of magnetic taconite has been reduced at one openpit mine. Large blocks of the hard, but easily shattered rock are broken with a conventional "Drop ball."

CONVEYING

Since 1937 when Butler Brothers made the first installation of a belt conveyor in an openpit mine, this transportation medium has grown in importance every year. Conveyor-belt systems are generally installed in a permanent location to transport and elevate ore to a washing plant or loading pocket on the pit's rim. Trucks or other types of mobile equipment transport the ore, within the pit, to the conveyor loading pocket.

The first steel-cord conveyor belt was installed in 1942 and its use is growing. Nearly all belts are enclosed in galleries to afford protection from the weather. At one stockpiling operation in northern Michigan an experimental heated gallery will be used for winter transportation of ore.

Rubber-Covered Rollers

The use of rubber-covered rollers instead of pneumatic tires at impact points, i.e. belt loading and transfer points, is increasing. In many instances the tires had to be mounted with too great a distance between shock absorption points and the belt was cut or damaged between the tire-belt contact areas.

OCTOBER, 1951



LEFT: Two-way radio communication is proving increasingly popular in speeding up pit operations. One of the first mines in the Mesabi to institute such two-way control on a 100 percent basis was Oliver's Rouchleau. Here Arne Mattila, dispatcher, calls a train from his shack on the pit rim. The board in the window lists the several locations under the control of this "power." RIGHT: At the microphone in the cab of Number 1102, a 1,600 horsepower Diesel electric locomotive, Russel Prince replies, "Roger," to instructions received from the dispatcher.

Dual Drives

Several of the larger conveyor belts are driven, at the head end, by dual drives—two electric motors through herringbone-gear speed reducers.

Belt Cleaning

Several types of belt scrapers and belt-washing devices have been used to keep the underside (drive pulley side) of the belt free from an accumulating buildup of transported material.

One company is using a belt which is turned over after discharging, so as to keep the clean side of the belt against the return idlers.

Belts At Steep Rock

Steep Rock Iron Mines Ltd. is developing, to mine its "B" orebody in depth, a series of conveyor belts, each 4,000 feet long, to be used to elevate ore up a 16° slope from each level. Level interval will be 200 feet.

SHOVELS

Electric shovels continue to be the most practical type for loading both ore and overburden. Larger shovels are the trend and with the use of larger trucks, shovels with buckets of up to a 7½-cubic yard-capacity are now used for routine loading, whereas the larger shovels were formerly used only for railroad-car loading.

Because of their mobility Diesel-powered shovels are used for loading stockpiles and for cleaning up small remnants of ore in the pits.

TRUCKING

The most spectacular development in open-pit-mining equipment has been the phenomenal growth in the capacity of trucks during the last few years. This one factor has

made reappraisal of many mining properties necessary and has contributed to the mining of much ore at lower costs than had been heretofore believed possible to attain.

ILLD Uses 32-Yard Box

In 1945 large trucks were considered to be those with a 10-cubic-yard body. Today the largest truck (experimental ILLD) has a water-level body capacity of 32 cubic yards, weighs 104,820 pounds empty, uses 10 18 by 33 inch 32-ply tires and is powered by two super charged 300-hp. Diesel engines, each driving one of two axles through a torque converter. The unit is reportedly working satisfactorily and the pay load probably can be increased when larger and heavier tires are available. The only change found necessary in a pit planned for use of this truck is to make the curves wider and of longer radius.

In some truck pits, road load-bearing capacity has been reached and the use of larger trucks will require more careful and costly road construction, drainage and maintenance.

Torque Converters

The torque converter is playing a most important part in the successful use of larger trucks. Larger loads require more powerful engines creating a problem of smooth power transmission. Converters reduce shock loading of the driving train by gear shifting, act as a multiple speed transmission, and cushion shock loads to driving train induced by rough roads. Their use cuts truck and tire maintenance and reduces time for repairs. However, fuel consumption is increased by using converters.

Tournarockers

Tournarockers have been used at several open pits and have won praise at one stripping operation be-



Pioneers in new mining techniques are from left to right: Harry S. Petersen, general superintendent, Jones And Laughlin Ore Company; Dan S. Young, chief engineer, Oglebay Norton & Company; Richard M. Belliveau, district superintendent, Cleveland-Cliffs Iron Company; Lloyd Bredvold, mine superintendent, South Agnew Mining Company and the Morton Ore Company.

cause of their maneuverability and short-turning radius around the shovel. Their fast "over the bank" dumping has been of interest to another operator.

RAIL PITS

The rail pits are still "king of the range" for efficient, low-cost moving of large tonnages of overburden and ore. The big mines developed in recent years such as the Alworth, Auburn, Fraser, Monroe-Tener and Rouchleau use rail pits as will the new King mine on the western end of the Mesabi. It was proven during World War II that production of ore could be rapidly expanded from the rail pits in case of necessity.

Diesel Locomotives

Because of their greater availability and lower operating cost, Diesel-electric locomotives are gradually replacing coal-fired steam locomotives as prime movers in the open-pit mines. Those pits equipped to service and handle steam locomotives still use them, but all new engines being purchased are Diesels. They are shorter coupled, weigh less and can operate on track when steam-engine operation is not considered practical.

ORE BLENDING IN PITS

Initial all-rail shipments of ore from the pits created a problem in regard to maintaining a desired grade. Lake shipments are blended to desired grade by sequential car dumping and mixing into the docks and boats during loading. This type of blending is impossible for the rail shipments so a system of building blending stockpiles has been placed in operation at each pit.

In the truck pits horizontal layers of various types of ore are built up in four-foot-thick beds. Trucks climb up the pile and dump their loads on top. The loads are leveled and sampled and another layer of different grade ore is added. According to the shipment desired, a shovel mixes and loads from the blended stockpile.

In rail pits three parallel tracks

are laid about 15 feet above the bottom of a trench and 40 feet apart. Side-dump pit cars dump into the pit between the tracks. Piles are levelled into layers with a long-wing railroad plow. When the trench has been filled and the average of all layers meets the desired grade, a string of empty gondolas and hopper-bottom cars is spotted on one of the raised tracks. A 6½-yard electric shovel mixes the layers by passing the open bucket through the pile several times from bottom to top.

AUXILIARY PIT EQUIPMENT

This equipment is used primarily to service and supply facilities to keep the drilling, loading and transportation equipment in the pit operating at top efficiency. The rail pits use railroad locomotive cranes, track shifters, spreader plows for levelling dumps, track shifters and speeders. The truck pits use motor graders, sprinkling and fueling trucks and mobile greasing trucks. Both types of pits employ tractors, rubber-tired dozers, body-cleaning equipment, floodlights and pumps.

FM Radios

The Oliver Iron Mining Company has installed FM radio sending and receiving sets to speed communications at its Rouchleau and Sherman group pits. The system operates on a frequency assigned and licensed by the Federal Communication Commission. Receiving and transmitting sets are installed in pit-superintendent's cars, in Diesel-locomotive cabs, in waste-dump switch shanties, train dispatcher offices, assay laboratories and general offices. Time and money is saved by the system. Orders, reports and other information is instantaneously reported between stations. The pit superintendent knows what is going on in the entire area under his supervision and can make decisions and issue orders without travelling several miles to change a shovel from one grade of ore to another.

Side-Hill Skips

The counter-balanced, side-hill, inclined-skip (38°) hoisting system

pioneered by the South Agnew Mining Company at Hibbing, Minnesota has proved to be so successful that similar installations will be made at the Morton mine of the Morton Ore Company, at the Whiteside mine of the Snyder Mining Company and the Schley mine of the Inter-State Iron Company.

The use of skip hoists at small cross-sectional, deep orebodies has made possible open-pit mining of ore formerly classified as mineable only by underground methods. By using skips all the ore is mined in each succeeding lift, since the usual system of leaving ore to support a transportation system can be eliminated.

UNDERGROUND TECHNIQUES

Deeper mines, smaller orebodies, greater capital investment, higher wages, costlier timber and a shortage of skilled underground miners has necessitated mine mechanization and the adoption of new mining equipment and techniques to prevent increasing mining costs.

A new hydraulically operated clam-shell bucket has been used for shaft mucking with a gain in speed and a lessening of man hours. A new bottom-dumping skip is being used in Michigan. The entire bottom of the skip opens to permit the ore to discharge rapidly. The door has a water-tight seal to prevent loss of contents during hoisting.

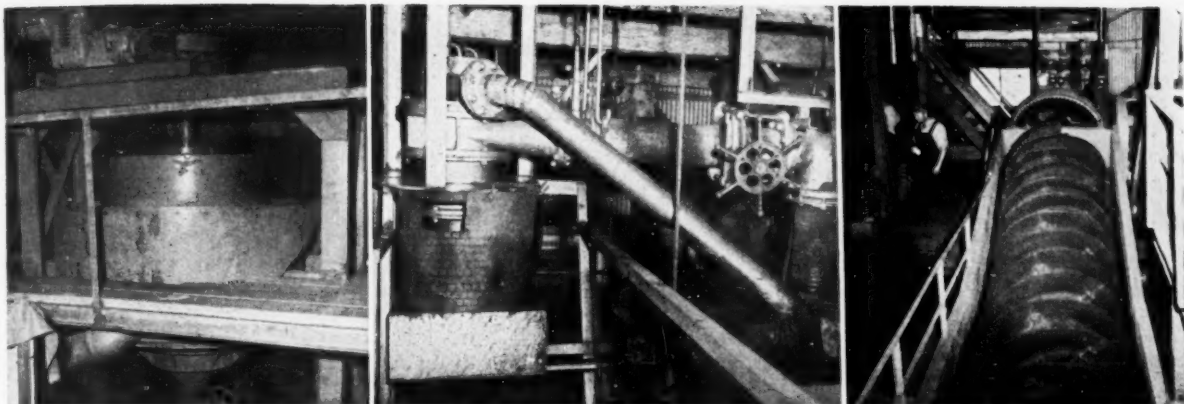
Timber Preservation

Underground mines in Minnesota and Michigan are using more and more treated timber for main-level and transfer-drift support. These must be kept open as long as 15 years in many mines and, with the average life of untreated timber about three years, timber replacement to keep the drifts open is costly both in timber and man hours. A commercial plant is in operation at Bessemer, Michigan preserving timber for several mines. Some large companies operate their own treating plants.

Belts, Sets and Bits

Main-level belt transportation of sized ore from transfer drifts to shaft pockets is growing. The method is cheaper, operates with fewer men and requires less capital investment than ore-car transportation does. The Mather mine "A" shaft of the Cleveland-Cliffs Iron Company is using arched-steel sets in transfer drifts in heavy ground. Their use has cut down on expensive maintenance necessary when timber sets are used. A variety of bits—one-use or tungsten-carbide—are used according to the type of the ground being drilled.

MINING WORLD



LEFT: The first commercial size (five-foot) model of the Weinig Concentrator is treating minus- $\frac{3}{8}$ -inch banded taconite at the Mary Ellen mine of the Stanley Mining Company in Minnesota. The high capacity unit is manufactured by the Colorado Iron Works Company. CENTER: One of two 12-inch Dutch State Mines Cyclone Separators at the Buckeye mine of the Hanna Ore Mining Company, Coleraine, Minnesota. This is the first large commercial installation in the United States of this equipment to treat ore and early results have been satisfactory. RIGHT: Akins classifiers are used in many washing plants on the Iron Ranges. A high silica fine sized product overflows to waste.

IRON ORE BENEFICIATION EXPANDS; FINER SIZES SUBJECT OF STUDY

Beneficiation of iron ore is practiced to a far greater degree than may generally be realized and continued expansion must be expected. While iron beneficiation methods are usually regarded as new metallurgical techniques, it is surprising to realize that more tons of iron concentrates are produced annually in the United States than all other metalliferous concentrates combined.

Some facts and comparisons to illustrate this: One-fourth of all iron ore produced (25,000,000 tons) is beneficiated in some manner. This does not include agglomeration which would raise the total to one-third. Of the crude iron ore mined, roughly one-half is subjected to some milling treatment. Of all crude metalliferous ore entering beneficiation plants in the United States last year, some 15 percent was iron. There are about 70 plants currently treating iron ore, and the number will probably reach 100 before 1953.

In spite of these imposing statistics, the industry is, in fact, just scratching the surface as far as metallurgical practices are concerned. The speed of progress, however, is startling. It is here that the greatest advancements in equipment and techniques for heavy-media separation have been made. Iron operations have adapted the Humphreys Spiral, for its designed purposes, on a more universal basis, perhaps, than any other portion of the industry except beach sands—by comparison, a minor tonnage; and it is in iron that much of the pioneering work on the Dutch State

Mines cyclone separator is going forward.

On the other hand, necessary and still unsolved procedures include satisfactory beneficiation of intermediate ores of minus- $\frac{1}{4}$ -inch particle size; concentration of non-magnetic cherty taconites; agglomeration or pelletizing of taconite (or any extremely fine) concentrates; and efficient dust collection.

Virtually dormant techniques that deserve further study: Flotation, roasting followed by magnetic concentration, and chemical methods.

Greatest single criticism leveled at the industry (usually by metallurgical purists) is that material diverted to lean ore stockpiles and tailing ponds for recovery at a future date could be recovered by additions to present milling circuits. This is, in many cases, true. It should be noted that this is a common fault in milling and that rapid progress is being made toward recovering everything possible the first time through the plant.

In the east and to a large extent in the southeast, ores are beneficiated. In the far west, none require treatment. The Lake Superior district is in the great zone of transition. Current production in the east is all magnetite, and standard practice is magnetic concentration followed by sintering. In the south, hand sorting, washing, gravity concentration, and HMS are employed. In Minnesota and Michigan, operators seem disposed to try anything within reason, and it seems to be working out.

Ten years ago, only 18.8 percent of the ore shipped from the Lake Superior district was beneficiated. Last year, the figure had jumped to 30.5 percent. In 1940, 78.5 percent of the total beneficiated was treated by simple washing and 21.5 percent by jigs, HMS, gravity, etc. By 1950 the figures had changed to 65.6 percent washing and 34.4 percent by other methods. In the next ten years, this trend should be even more pronounced.

TREATING WASH ORES

Ores amenable to treatment by simple washing are those in which the intermediate sizes are of sufficient grade to permit shipment. Large chunks are scalped off to waste. The balance is washed on vibrating screens with fine sizes going to classifiers where the minus-28-mesh to minus-65-mesh overflows to waste. In some circuits, log washers are used to break up and free ore from gangue.

Washing plants have changed little through the past several years, but certain aspects of the process have never been completely satisfactory. As simple wash ores become even slightly more complex (a tighter bind between silica and ore develops), crushing must be used on the larger sizes and the fines become a major problem. The fact is, washing of minus- $\frac{1}{4}$ -inch material has never worked very well, and much attention is being given to this problem. Each year more complex units are being added to washing

plants in order to extend the range of material handled and to maintain an acceptable grade.

SELECTIVE MEDIA CONC.

A most determined effort to effect an improvement in gravity concentration of wash ore that has grown slightly more complex is being carried forward at the Trout Lake concentrator of the Oliver Iron Mining Company. There, a selective media concentrator, developed and manufactured by Stearns-Roger Manufacturing Company, has been operated for the past four seasons. It has been tested in many ways, on various size ranges and tonnages of feed, on different types of ores, etc.

Because experimental work has not been completed, Oliver isn't talking about results; however, the machine is operating in the regular circuit and producing concentrates. Other operators have tried it, briefly, under various special conditions. Definite results have not yet been reported.

If the machine produces concentrates satisfactorily, it will offer several apparent advantages. It occupies a small space per unit of capacity. It is simple to install, easy to operate, and should have rather low maintenance costs. It will accept a wide range of particle sizes—everything below 1½ inch—and power consumption is low.

HEAVY MEDIA SEPARATION

Intermediate ores are those ores which will not respond to concentration by washing and which are not a true taconite. They are being mined in increasing tonnages; and many pits that have been shipping washed ores are producing more complex material that is increasingly difficult to beneficiate. Most operators feel that the best answer, to date, is HMS.

Much of the early sink and float technique was developed at the Butler Brothers Mines on the ranges. The first installation was at the Merritt mine on the Cuyuna Range in 1937. Galena medium was used, but it had disadvantages. In 1939, a mill was built at the Harrison mine, and ferrosilicon medium was employed. The simpler recovery of medium appealed to operators. Seventeen such plants are now treating iron ore; eight more have recently been completed, are under construction or will be started during this season; and, by the beginning of 1953, there will be nearly 30 in operation.

The semi-portable or, more accurately, partially prefabricated plant has gained wide favor. The obvious advantages of standard components, coupled with fabrication under factory rather than field conditions, produce savings in cost and erection time. Performance of these units has been satisfactory.

Greatest improvement in HMS equipment has probably been made in the separatory vessel. The cone, never popular in the industry, has almost disappeared. The Akins spiral was the first radical departure. It eliminated the troublesome airlift, reduced the amount of media in the circuit, and seemed to simplify operation.

More recently, the Hardinge drum and Wemco drum separators have made their appearance. The Hardinge unit is, essentially, a classifier with spiral flights on the inside of a drum to convey the sink product to the upper end of the tank for removal. The Wemco machine is an ordinary drum with flights that lift the sink product from the bottom and discharge it into a launder in the upper-center of the drum. Each claims certain advantages in performance, efficiency, maintenance cost, etc.

Considerable experimental work

is being done on the removal of a middling product to improve grade and recovery. The middling can be crushed and reprocessed either by HMS or by some gravity method. Both the Akins and the Wemco machines can remove a middling, and Wemco had developed a double drum vessel especially to perform this task.

High media loss plagues most operators. While most non-ferrous plants lose 0.5 pounds per ton, many iron circuits will lose between 1 and 2 pounds per ton. For some of this, porous material such as limonite and paint rock can be blamed. Often, more can be attributed to inadequate washing screen capacity and overloaded magnetic separators in the media recovery circuit. These losses are being reduced.

Inability to treat minus-¼-inch material satisfactorily is all that keeps heavy-media separation from being the nearly perfect process on most intermediate ore. This is receiving more attention than any other single problem in the field of iron ore beneficiation.

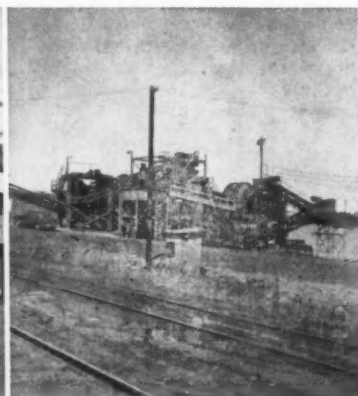
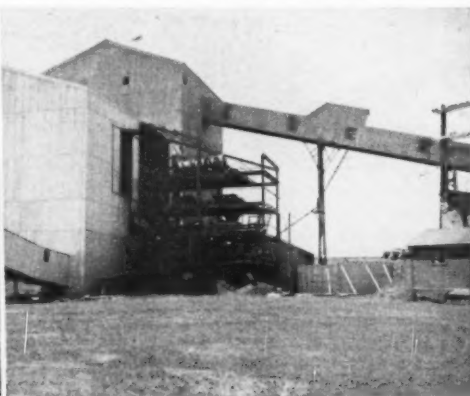
ABRASION MILLING

Metallurgists at Cleveland-Cliffs Iron Company achieved a measure of success when they introduced a stage of grinding, called abrasion milling, ahead of gravity concentration on the fine ores at the Hill-Trumbull plant.

Minus-⅛-inch material is deslimed in a classifier which rejects a high percentage of the silica. The rake product of the classifier enters a ball mill carrying a light ball charge (40 percent by volume). This operation is not grinding in the usual sense. Its object is to knock down the top sizes and to slime as much of the silica as possible without affecting the iron particles.

This conditions the feed so that the Humphreys Spirals are able to

LEFT: This new milling plant southwest of Evelyn, Minnesota, is being erected by the Western Knapp Engineering Company for the Coons-Pacific Company. The plant will treat ore from several pits, hauled in by rail, with HMS and Spirals. CENTER: Latest in a series of experimental plants to beneficiate iron fines is this addition to the Holman-Cliffs plant at Taconite, Minnesota of the Cleveland-Cliffs Iron Company. The HMS circuit with Hardinge drum separator should be ready to operate in late 1951. R.GHT: The Prindle mine HMS plant operated by the W. S. Moore Company near Virginia, Minnesota. Increased ore prices and HMS have made ore from low grade iron material. Increased stripping ratio at the Prindle has been offset by higher ore price.





LEFT: Washing plant tailing is being reclaimed at the Patrick mine, M. A. Hanna, operating agents, at Cooley, Minnesota. The dragline feeds the hopper of a portable screening plant. The tailing is screened, broken up and pulped with water and pumped through the 12-inch diameter line to the mill. RIGHT: The new Butler Brothers' (M. A. Hanna Company operating agents) Humphreys Spiral plant is treating the minus-6-mesh washing plant tailing.

produce a satisfactory product. Figures on recovery and grade do not stamp this an outstanding success, but, when the difficult nature of Hill-Trumbull ore is considered, abrasion milling is a triumph.

Another Cleveland-Cliffs practice that works is the treating of washing classifier overflow in a Dorr hydrosizer. The rising column of water floats away the lighter silica, and the settled material represents additional recovery.

HUMPHREYS SPIRAL

One piece of equipment that has come to the front rapidly on the Minnesota Ranges is the Humphreys Spiral. It is regarded by many as the best available gravity concentrator for iron ore. Many, if not most, of the HMS plants have installed spirals to concentrate materials in the minus-65-mesh sizes. A number handle everything smaller than $\frac{1}{8}$ inch. Results have been acceptable.

M. A. Hanna Company recently completed a plant at its Patrick mine which extended the use of the spiral and the value of Patrick reserves. Fine, high-silica material that overflowed the washing plant classifiers in past years is being reclaimed from the tailing pond and beneficiated by three stages of spiral concentration. Results are good.

Now, for the first time in the iron industry, two plants are being built that will use the spiral as the primary means of beneficiating newly mined, low-grade ores that must be finely ground before treatment. Jones and Laughlin Ore Company will treat some 1,000,000 tons of martite (non-magnetic iron) ore to produce 300,000 tons of concentrate annually at its Benson mines in New York. M. A. Hanna is erecting a 10-ton-per-hour pilot plant to test beneficiation practice on the low-grade hematite of its Groveland mine in Michigan.

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WEINIG CONCENTRATOR

Latest arrival in the field of devices to beneficiate fine ores by gravity is the Weinig Concentrator. Manufactured by the Colorado Iron Works Company in Denver, Colorado, the first commercial-sized unit was installed last year at the Mary Ellen mine of the Stanley Mining Company in Minnesota. It is handling minus- $\frac{3}{16}$ -inch material, the size not considered amenable to treatment in the regular HMS circuit.

The machine is, basically, a modified and improved high-capacity version of the old Weatherbee Iron Ore Concentrator. Mechanically simple, it consists of a cylindrical rotor operating in a circular tank of larger diameter. It has a spigot discharge at the bottom for sink product and annular, sloping launders around the top to collect the overflowing waste.

DSM CYCLONE SEPARATOR

A number of operators are beginning to feel the simple gravity concentration in water will not provide a satisfactory solution to the problem of treating the fine particle sizes of intermediate ores. Two of them are seeking the answer by making the separation in a liquid of high specific gravity. The major difficulties encountered in applying all previous methods of heavy density concentration to the smaller size ranges have been finding a satisfactory separatory vessel and recovering media from the treated products.

M. A. Hanna Company, with its installation of Dutch State Mine Cyclone Separators at the Buckeye Mine, is farthest advanced with this program. The commercial plant followed a year of pilot plant work with a small cyclone (see *Mining World* July 1951.)

Heart of the new mill is a pair of 12 inch Dutch State Mines Cyclone

Separators, somewhat modified, that readily handle 125 tons per hour of minus- $\frac{1}{4}$ -inch hematite ore. Buckeye ore is of good iron grade but runs excessively high in silica—sometimes more than 30 percent. In the pilot plant no difficulty was experienced in reducing this to the required 11 percent, or less, with no appreciable iron loss. From an operating standpoint the cyclone was a satisfactory separatory vessel, and its performance was about 98 percent as efficient as heavy liquid separation in a beaker.

While the period of operation has been too short to permit positive statements about the commercial plant, early indications are that pilot results should, at least, be equalled.

Two separate circuits, each with primary and secondary Jeffrey, drum-type magnetic separators, solve the problem of medium recovery in the Cyclone Separator Process at Buckeye. All concentrates flow to one circuit; the other handles all waste. The practice of washing medium free of the ore and waste on screens and recovering it from the combined wash water, as practiced in HMS circuits, was not effective when treatment was confined to fine materials.

Exact media loss has not been determined. It will probably exceed pounds per ton losses in a circuit treating coarse materials but should not be unreasonable. Also, medium used in the cyclone is magnetite which is much cheaper than the ferrosilicon required by most HMS plants.

Soon to enter the large pilot plant state is work of a similar nature at Cleveland-Cliffs Iron Company's Holman Cliffs mine where an addition is being built and equipment installed. It is understood that the DSM Cyclone Separator Process and Heavy-Media Separation in a Hardinge drum separator will be operated under identical semi-commercial conditions on material of minus- $\frac{1}{4}$ -inch size.

[World Mining Section—21]

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Key figures in iron ore beneficiation developments include, LEFT TO RIGHT: Graver LeVeque, general manager and vice president of the Inter-State Iron Company. The company operates a wide variety of plants in Minnesota. Stephen E. Erickson, beneficiation engineer, M. A. Hanna Company. Steve pioneered the installation of Dutch State Mines Cyclone Separators. L. J. Erck, chief metallurgist, Cleveland-Cliffs Iron Company. Erck directs a large laboratory dealing solely with iron ore beneficiation.

JIGGING

Jigs are being used successfully in a number of places. There is, however, no widespread increase in their use as the primary method of concentration. They are gaining favor for treating $\frac{3}{8}$ inch to 100-mesh material in connection with HMS circuits.

Some interesting experimental work is being conducted by the Charleson Iron Company in Minnesota in an attempt to increase the size range of material handled by jigs. Charleson currently feeds a full-size range of deslimed dump material to its jiggling circuits. There is no screening ahead of the jigs and each jig receives all sizes of material.

It is planned to settle the slime and return all material down to 10 microns in size to the head of the circuit. Installation of necessary equipment has not been completed.

MAGNETIC CONCENTRATION

Giving almost universally satisfactory results in treating magnetites is the magnetic separator. Virtually all iron produced in the eastern states is beneficiated by this method. Magnetic concentration equipment has reached a stage of development where it can be adapted to the treatment of almost any type of magnetic iron ore, and operators like the positive separation and reasonable costs.

In treating magnetic taconites, the method seems equally well-suited. No other beneficiation practice has proved as good, and the only indefinite factor is the best type of machine for the material being handled.

MILLING NON-MAGNETICS

Gravity concentration in Humphreys Spirals, by virtue of Jones & Laughlin's martite plant at Benson mines (see above), will be the

method treating the largest tonnages of finely disseminated, non-magnetic material during the next few years. Benson's martite, however, frees at a relatively coarse grind and operators are not convinced that the same method will be satisfactory on non-magnetic taconites which must be ground to minus-200-mesh.

To many, flotation is the logical answer. Experimental work has shown that taconites can be floated, and that many low-grade hematites float readily in an acid circuit. The chief obstacle to the adoption of flotation for the recovery of values from the fines of intermediate ores, as well as from taconites, seems to be operators' objection to the large investments and huge plants required. This resistance may fade as the evolution of ferrous metallurgy progresses.

On the other hand, roasting of non-magnetic taconites to make them amenable to magnetic concentration may possibly be preferred to flotation. Work of the Minnesota Mines Experiment Station in cooperation with Butler Brothers indicated that the practice was entirely feasible and practical. After crushing to about minus-14-mesh, ore was roasted in a chimney-type furnace and beneficiated much as magnetites are handled in Adirondack mills.

AGGLOMERATION

Producing satisfactory blast furnace feed from extremely fine iron concentrates is a major obstacle in the way of taconite developments, recovery of low-grade hematites, and the adoption of flotation treatment for some ores. Progress toward a solution is being made.

There are two schools of thought on the subject—sintering and pelletizing. Because long experience has seemed to limit successful sintering to relatively coarse particle sizes (larger than 20-mesh), most effort has been directed toward perfecting a method of pelletizing. Four semi-

commercial-sized plants are conducting testwork under continuous operating conditions, and one large plant is under construction.

The method of forming the pellets in a balling drum has been rather well-accepted, and the unsolved problem is firing the pellets to give them the necessary hardness to withstand transportation and repeated handling. All plants mentioned use chimney-type furnaces for this, but the Allis-Chalmers Manufacturing Company is conducting large-scale tests with firing on a moving-grate, sintering machine. Plain taconite and taconite with various binders, such as starch, coal, bentonite, have been tested. All seem to work well part of the time; none work well all of the time.

Actually, recent reports emanating from these plants indicate that increasingly long, continuous runs that produce satisfactory pellets are being achieved.

Oliver Iron Mining Company has attacked the problem from the other angle, and has nearly completed a large agglomerating plant south of Virginia, Minnesota. The plant includes a continuous-grate, sintering machine and a nodulizing kiln 12 feet in diameter and 350 feet long. It will treat the concentrates produced by the new taconite pilot plant (see Taconite Section) now under construction.

Jones and Laughlin Ore Company has developed two new ideas for sintering operations. On their continuous-grate machines, they have substituted roll feeders for the conventional swinging spouts and leveling boards. More uniform burning and improved grade of sinter has resulted. In the sintering plant being built to handle concentrates from their new martite mill, the grate will be considerably longer than usual, and the last 35 feet, over the wind boxes, will be used for cooling the sinter on the grate. Facilities for controlling the amount and size of sinter return are being installed.

DUST COLLECTION

Wetting agents are growing in favor, especially for settling dust at crushers and conveyor-belt transfer points in dry-crushing plants. A number of good products are on the market, and package units, tank, and spray equipment in several sizes are available. Costs are nominal, and results reported have been most promising.

In conclusion, it seems safe to assume that, barring a major economic slump, metallurgical practices and techniques in the field of iron-ore production will advance rapidly during the next several years. During the same period, iron-ore operations will probably build more new beneficiation capacity than the rest of the metal mining industry combined.

NEW SEPARATOR Cuts Tailings Losses

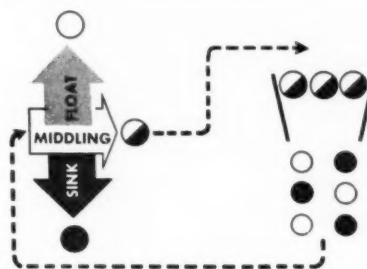
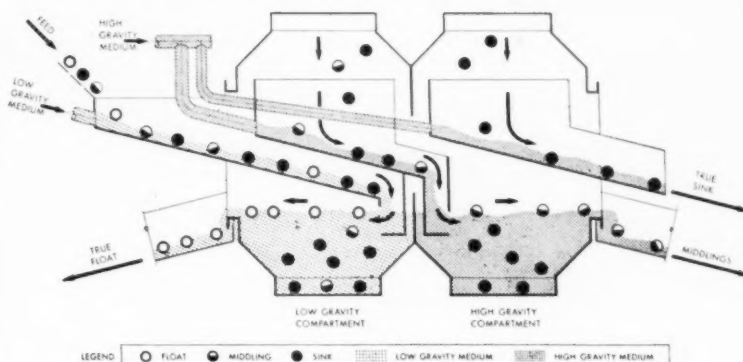
Improved two-stage separation equipment brings new standards of control to Heavy-Media Separation.

Substantial reductions in tailings losses with significant upgrading of the valuable product are gained by accurate gravity control in the new WEMCO Two-Compartment Drum Separator. Incorporated in the WEMCO Mobil-Mill, the improved separator represents an important advance in Heavy-Media Separation techniques.

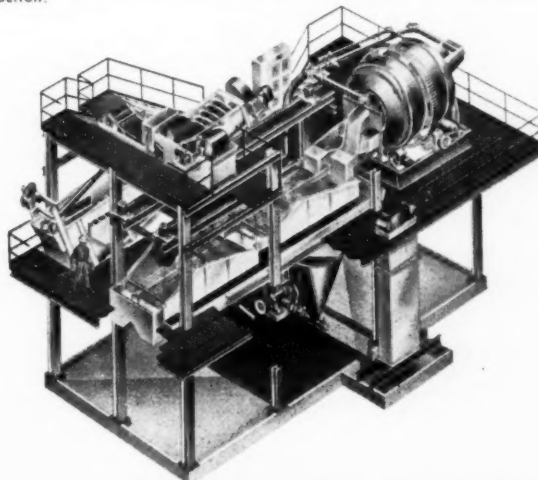
Three distinct materials are produced by the WEMCO unit: (1) a true float product, (2) a true sink material, and (3) a middling which may be re-crushed and re-cycled to the separator for recovery of the valuable fraction.

Since only the middling is re-crushed, increased capacity without costly duplication of equipment or increased floor space results. Investment and operating costs are lower per ton of valuable product and media losses are kept to a minimum by the efficient design of this new WEMCO Two-Compartment Separator.

Inquiries for further information should be directed to the manufacturer.



Illustrating WEMCO'S method of producing 3 products in a single separatory vessel by accurate control of heavy medium. Middling is re-cycled through separator to decrease tailings and to increase valuable mineral production.



WEMCO Mobil-Mill with new type Drum Separator.

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Hydroseparators • HMS Laboratory Units
Dewatering Spirals • Agitators • S-H Classifiers
Thickeners • Sand Pumps • Conditioners



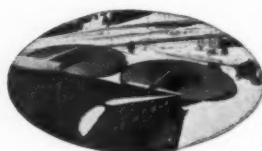
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ACTIVITIES OF INTERNATIONAL MINING MEN

CORNELIUS F. KELLEY, chairman of the board of Anaconda Copper Mining Company, will serve as chairman of the National Convention Committee of the Thirty-Eighth National Foreign Trade Convention to be held at the Waldorf-Astoria Hotel in New York City, October 29-31, 1951. Among those serving as regional vice chairmen are R. S. Hecht, chairman of the board, Mississippi Shipping Company, Inc., New Orleans, Louisiana; Edward M. Ryan, vice president in charge of foreign operations, International Harvester Company, Chicago, Illinois; and Russell G. Smith, executive vice president, Bank of America N.T. & S.A., San Francisco, California.



S. V. Allen, commercial secretary of the Canadian Embassy, has been designated by the Canadian government as its representative on the Tungsten-Molybdenum Committee of the International Materials Conference.

H. Watanabe was head of a Japanese trade mission which recently visited India. Other members of the mission were J. Tani, Y. Hirose, and H. Taki.

H. T. Hutchinson, formerly master mechanic for the Caligher Company at Monticello, Utah, has been transferred to New Caledonia where he will be mechanical and electrical superintendent of a lead-zinc chrome mill which is being financed by the U. S. Economic Cooperation Administration.

Dr. J. E. Holloway is chairman of the board of directors of a new company, Swiss Union Trust for South Africa (Pty.) Ltd., formed by the Union Bank of Switzerland and INTRAG Management of Investment Trusts Ltd. The new organization will assist and advise INTRAG in the management and administration of the investments of the South Africa Trust Fund (SAFIT). Other directors are Dr. M. S. Louw, M. Clough, H. S. H. Donald, F. Richner, (INTRAG chairman), E. N. Goodwin, Dr. P. Thorn, and Dr. A. Jann.

Dr. Zay Jeffries, metallurgical scientist, is director-general of the World Metallurgical Congress which meets in Detroit, Michigan, October 14 through 19. The U. S. Economic Cooperation Administration has set aside more than \$500,000 to enable 11 groups of leading metallurgists from Marshall Plan countries to attend.

R. W. Diamond, president of Consolidated Mining & Smelting Company announces the appointment of J. Brydem, J. H. Salter and B. P. Sutherland as administrative assistants at Trail, B. C. All three joined the company some years ago in junior capacities. D. D. Morris has been appointed to the new position of manager of research and development.

William Gruenewald, consulting geologist, has opened offices in the Pure Oil Building, 35 East Wacker Drive, Chicago, Illinois. Much of his professional experience was gained in such parts of the world as the Philippines, China, Tibet,

Malaya, Central Africa, Canada, and the South American Republics of Brazil, Argentina, and Venezuela. For the past two years, he was associated with Paul Weir Company, coal consultants in Chicago.

G. B. O. Penn, former mine superintendent of O'Okiep Mine, Namaqualand, is now resident engineer for Rio Tinto Company, Ltd., Johannesburg.

A. N. Napier has been promoted to assistant general manager of Amalgamated Banket Areas, Ltd. He was mine manager of South Banket Areas, Ltd.

Carlos Mordojovich has taken the position of geologist with Empresa Nacional del Petroleo, Punta Arenas, Chile. He was formerly employed as a geologist with Corp. de Fomento de la Produccion.

C. W. S. Tremaine has been appointed consulting mining engineer for Doreen Mines, 50 miles from Hazelton, B. C., following the death of W. L. Norrie-Loewenthal, on whose recommendation the current development program was initiated.

T. C. Keefer is now Director of Special Studies of the Association of Professional Engineers, Province of Ontario, Canada. He is a mining engineer and had been mine manager of Dupont Mining Company's mine at Shoal Lake near Kenora.

W. H. Tyler has resigned as general manager of Lake George Mines Pty. Ltd., Captain's Flat, New South Wales, Australia, and is now in Western Australia.

Henry Brown, former mill superintendent of Patino Mines & Enterprises Consolidated Inc.'s property at Llallagua, Bolivia, is now in charge of Bolivian Tin

Rafael Mireles Plata, mine inspector of Direccion General de Minas y Petroleo, Secretaria de Economia, Mexico, D.F., recently made a survey of the mineral resources in the Alamos region of Sonora. He was particularly interested in



cobalt, tungsten, copper, lead, manganese, and other strategic metals. Ing. Mireles' mission for the Mexican government is to stimulate mining activity, especially among the small operators. He will also go to Cananea, Sonora, where he will study the operations of Cananea Consolidated Copper Company, one of the largest copper producers in Mexico, and later he will visit mining areas in Lower California.

& Tungsten Mines in Huanuni, another Patino property.

Stanley Hughes, who supervised the design of the Kennecott Copper Corporation's \$16,000,000 electrolytic refinery at Garfield, Utah, has been named assistant to the general manager of Western Mining Divisions with the accent on smelting and refining operations. He will be adviser to Louis Buchman, general manager of those divisions, and will be liaison man between Kennecott and the American Smelting and Refining Company, operator of the Garfield copper smelter. Hughes graduated from the University of Michigan in chemical engineering and joined AS&R in 1913; he was loaned to Kennecott in 1948, and this led to his present appointment.

Hugh Park, president of Nipissing Mines Company, Ltd., Toronto, Ontario, Canada, has resigned his more active duties to become consulting engineer only to the company. He first joined Nipissing 45 years ago.

William F. Jones has been promoted superintendent of the Boston, Massachusetts, plant of the National Lead Company, New York, New York, succeeding **Herbert Shattuck**, retired. **Harvey Morgan** has been appointed superintendent of the Buffalo, New York, plant. He had been assistant superintendent at the Cincinnati, Ohio, plant.

Dr. N. H. Magnusson of the Royal Institute of Technology was appointed director-in-chief of the Statens Geologiska Undersokning (the Swedish Geological Research Society) recently, and **Dr. B. W. Larsson** was appointed state geologist.

John Drybrough of Winnipeg has been elected a director of Sherritt Gordon Mines Ltd., Toronto, Ontario, Canada. He is president of Baren's River Mines. Other Canadian appointments recently in the news include that of **A. J. Theis** and **J. E. Fox** as directors of Kootenay Belle Gold Mines Ltd., Nelson, British Columbia; and **James G. McCrea** as vice president of Sigma Mines (Quebec) Ltd. He had been general manager and will be succeeded by **J. B. Redpath**, former assistant. **R. S. Douglas** has been made general manager of Canadian Exploration Ltd., Vancouver, British Columbia.



Eugene Weberg, manager of the Union Miniere du Haut Katanga in the Belgian Congo, is making an extensive tour of U.S. mining properties to observe operating methods. His itinerary includes all of the important metal mines of the Iron Ranges, Utah, Montana, Nevada, California, and Arizona. One of the first stops was at Mather mine in Ishpeming, Michigan, operated by Cleveland-Cliffs Iron Company. Left to right: Mr. Weberg; **Harry C. Swanson**, assistant mine superintendent; and **Marcel Dupont**, New York mining consultant who is accompanying Mr. Weberg. Not pictured are **Dean LaGrange** of the Elmcro Corporation and **David Macine** of Escanaba, Michigan, who joined the party on their trip through the mine.

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CONCENTRATION PROCESSES FOR HEMATITE

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6" x 1/4"

DUTCH STATE MINES
CYCLONE SEPARATOR
3/8" x 65 mesh

FROTH FLOTATION
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Now Range metallurgists pioneer again . . . with commercial operation of two Dutch State Mines Cyclone Separator plants to beneficiate over 150 tons an hour of Hematite fines in the 1/4" x 65 mesh size range . . . harbinger of an industry-wide determination to reclaim still more millions of tons of blast-furnace feed.

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What these three treatment methods are doing and can do for Hematite, they are doing and can do on practically every economically important metallic and non-metallic mineral. No matter what the size range in which most ores can best be pre-concentrated and/or concentrated, Cyanamid can provide the process to achieve the highest possible recovery at the lowest practical cost.

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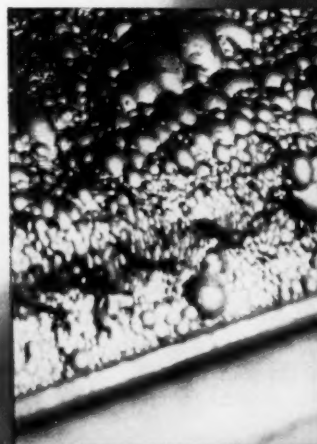
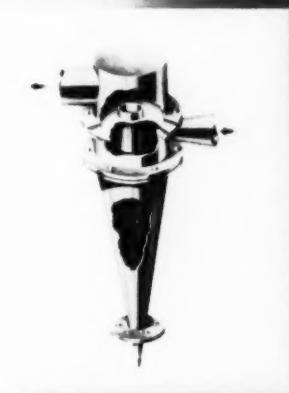
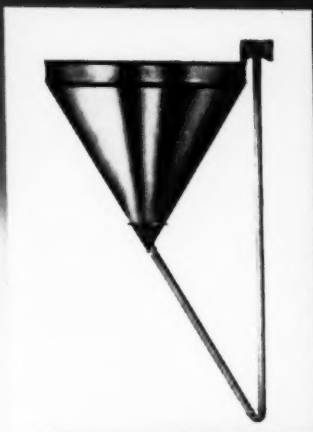
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INTERNATIONAL NEWS

Proposed Mining Bank Considered By Mexico

Mexican President Miguel Aleman is considering a proposal made by Rafael Arroyo Alejandro, president of the National Economic Recovery Association, for the establishment of a national bank which would assure systematic working of Mexico's metal and mineral reserves.

Plans would call for the bank to be capitalized for 125,000,000 pesos (\$14,100,000). It would particularly supervise the working of important gold and silver deposits, especially those in Guerrero, Michoacan, Sinaloa, Sonora, and Baja California. The bank would also set up and operate four large refineries to treat gold-silver ore, yields of which would go to the national monetary reserves as the plan stipulates that "not a gram of gold or silver thus obtained be exported."

Cooperating with the Bank of Mexico, the Association would arrange for the minting of gold and silver coins from refined metals. The Association estimates that within five years the Mexican treasury's reserves would have at least 10,000,000,000 pesos in gold produced by the proposed mining bank. That, the plan contends, would "give Mexican money a just value and go far toward equalizing Mexico's economic balance." The bank would retain 55 percent of its liquid income and use the rest to finance development of mineral reserves and small-scale mining.

India Surveys Atomic Mineral Reserves

A nation-wide survey has been undertaken by India's Atomic Energy Commission to locate ore deposits and to assess the country's reserve minerals used in atomic energy, such as uranium, thorium, beryl and monazite. One of the short term objectives of the Commission is to construct a small atomic pile for experimental purposes and for production of radioactive isotopes and by-products.

A plant capable of processing 1,500 tons of monazite per annum is being set up at Alwaye. The plant will be self-supporting by meeting its operating costs through the sale of thorium compounds to the indigenous gas-mantle industry. The Commission has offered to buy all stocks of uranium ore and plans are in an advanced stage for the setting up of a factory for the production of uranium and thorium compounds.

Two uranium-bearing belts have recently been discovered in Eastern and Central India. The Commission is not only acquiring all the existing stocks of beryl but is offering rewards for the discovery of new deposits. A pilot plant is being set up for manufacturing beryllium in the National Metallurgical Laboratory. Fundamental instruction and research work is being conducted in the laboratories of the Atomic Energy Commission and the Tata Institute of Fundamental Research. The Tata Institute has been chosen by the Commission as the

centre for its large-scale undertakings. The Institute has been entrusted with training a number of scientific workers to man the permanent establishment of the Commission. The Instrument Section of the Commission at the Tata Institute designs and makes most of the electronic and other special equipment required for the detection of atomic particles, and the meters and other apparatus needed in the geological survey for radioactive deposits.

British Columbian Iron Ore Goes to Japan

Argonaut Company, Ltd., subsidiary of the Utah Construction Company, has made its first shipment of 10,000 tons of iron ore from its Quinsam Lake, Vancouver Island property to Japan. The company has initial commitments for the shipment of 400,000 tons of iron ore to the Asian country, whose steel furnaces have been facing a slowdown since Manchurian iron sources were disrupted. When operations at Argonaut's property are in full swing, in excess of 50,000 tons monthly will be shipped.

The company has completed construction of a mill, dock, and 28-mile truck road and is strip-mining the deposits. The actual owner of the property is the Esquimalt and Nanaimo Railway, subsidiary of the Canadian Pacific Railway. Contracts with the Esquimalt call for diversion of the ore to Canadian mills, if a shortage of iron occurs in Canada.

Kaiser Acquires BWI Bauxite Properties

Kaiser Aluminum & Chemical Corporation has purchased or optioned about 11,000 acres of bauxite properties in Jamaica to supplement present aluminum ore sources by 1,000,000 tons a year. The proximity of these reserves to the company's Baton Rouge, Louisiana aluminum plant will reduce shipping distance by more than half, compared with present sources.

Major equipment has been ordered for mining operations, a company railroad, processing buildings, and a deep-water dock. First shipments of ore are expected by September 1952. The cost of developing the Jamaica bauxite and the adaptation of the Baton Rouge plant to process the ore is estimated at \$14,500,000.

Ergani To Raise Blister Copper Production

A triple drive is under way at the Ergani copper mine and smelter near Diyarbakir, Turkey to produce 14,100 tons of blister copper this year. The facilities, owned by the Eti Bank in Turkey, turned out 11,700 tons in 1950.

First step is to increase plant capacity by putting a second, existing, water jacket furnace into use.

A method is also being sought to recover about 39 percent of the cobalt in

the ore, so distributed that a very high percentage of it cannot be freed from the gangue minerals by grinding. In the flotation of copper minerals, the cobalt remains in the tailing; in direct smelting (most of Ergani's ore is direct-smelted), it goes with the slag. At present, a high copper-high cobalt slag is obtained by selective converting, and experimental work is being done to recover cobalt from this slag.

A third step is to make use of the sulphur dioxide gas of the smelter, more than 40,000 tons of which is now going up the stack each year. In the past, transportation of the product proved a prohibiting factor in using the gas.

New Copper and Cobalt Mine in No. Rhodesia

A new copper and cobalt mine will be opened at Nkana South Limb, seven miles from Kitwe in Northern Rhodesia by Chibuluma Mines Limited. Recently incorporated with an authorized share capital of 500,000, all of the shares are held by Mufulira Copper Mines Limited which sold the area to Chibuluma Mines.

Production is scheduled to begin in 1956 and it is estimated that when in full operation about 16,000 long tons of copper and 500,000 pounds of cobalt will be produced annually.

The cost of equipping and developing the property will be about £3,500,000. Up to £3,000,000 of this will be lent by the United States Economic Cooperation Administration, under an agreement providing for repayment in copper and cobalt.

Ore reserves are estimated at 7,300,000 short tons, averaging 5.23 percent copper and 0.25 percent cobalt.

Indian Metals Company Increases Lead Output

Since the Metal Corporation of India Ltd. has taken over operation of the Zawar lead mines in Udaipur, production has increased from 189 tons in 1947 to 627 tons in 1950. This rate is steadily rising with output for the first four months of 1951 already reaching the 305-ton mark.

The mines had been partly developed by the Utilization Branch of the Geological Survey of India in 1942 at a cost of 1,200,000 rupees. The Metal Corporation took over the mines in 1945 and has since invested 4,200,000 rupees in the mines and a smelter at Tundee in Bihar.

A new ore dressing plant at the mines is being completed. Initial annual output according to current estimates will reach 9,000 tons of lead concentrates, averaging 65 percent lead content. With the completion of an additional sintering section and installation of another furnace, the smelter capacity at Tundee is also expected to increase to 500 tons per month.

These are the only lead-zinc deposits being exploited in India at present. The ore assays 12 to 16 percent lead and 10 to 12 percent zinc.

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INTERNATIONAL



LATIN AMERICA

MEXICO—Tests to extract uranium and vanadium from asphalt residues from Mexican crudes are being made by technicians of the *Petroleos Mexicanos* (*Pemex*), the official oil company. Similar research being done at Temple Mountain, Utah in the U.S. inspired the *Pemex* project.

BRAZIL—*Itabira Iron Mines* in Victoria, Brazil, plans to export 1,500,000 tons of iron ore this year, double that of any previous year, according to Colonel Juracy Magalhaes, president of the *Companhia Vale do Rio Doce* which controls the mines. The increase is attributed to new additions of capital, improved mining methods, double tracking of the ore-carrying railway, and better port facilities. Last year, more than 95 percent of Itabira's export was to the United States—689,304 tons.

VENEZUELA—About 60,000 tons of Venezuelan iron ore is being shipped to the United States each month, according to Frank W. Storms, vice president of the *Iron Mines Company of Venezuela*. Iron Mines is a subsidiary of *Bethlehem Steel Company*. Its deposits, under concession from the Venezuelan government, are located at El Pao. A vessel carrying 20,000 tons of ore sails from Puerto Hierro on the Caribbean every ten days for Sparrow Point near Baltimore, Maryland. These shipments will be increased to 2,000,000 tons or more per year when additional barges are soon put into service. Some of those already in use carry up to 8,000 tons.

ARGENTINA—The consumption of manganese in Argentina is said to be about 2,000 tons annually, not including that used for dry cell manufacture. The main sources of manganese now are the *Cordoba* and *Santiago del Estero* mines, so far only superficially exploited, where grade averages from 35 to 40 percent manganese. A rise in demand for manganese is expected soon since a second iron plant in San Nicolas (Buenos Aires Province) and several allied metal working plants are about to start operating.

BRAZIL—A plant for the treatment of monazite has been erected at Guarapari, Espirito Santo, where large amounts of monazite have been found. This is the third monazite plant in Brazil.

ARGENTINA—Preliminary geologic studies have been started in the Rawson and Punta Lobos areas of Chubut Territory in southern Argentina and development of the gypsum and kaolin deposits there seem promising. In the Santa Victoria region of Salta Province in northern Argentina, prospecting of nickel and cobalt deposits is under way, while a successful survey has been completed of the antimony, bismuth, lead, sulphur, borates, and argonite deposits of San Antonio de Los Cobres (Puna de Atacama).

VENEZUELA—Bauxite deposits have been found north of Upaba, Bolivar state, not far from *Bethlehem Steel Company's* El Pao iron ore properties. Estimates of tonnage run to 300,000 tons. The discovery was made by three Vene-

zuelan geologists of the Department of Hydrocarbons and Mines.

PERU—Copper deposits have been found in the Department of Tacna and were reported to be comparable in grade to Chuquicamata's copper orebody. The building of access roads to the deposits is said to be under way.

HONDURAS—*Cia. Minera Agua Fria*, 110 kilometers east of Tegucigalpa, currently is producing 2,400 tons of gold ore per month, employing a crew of 200 men, and a five-by-six-foot Marcy ball mill is being installed to increase present mill capacity. A mine development program by core drilling is now in progress. C. P. Keegel is manager, Paul Juilland is mine superintendent, and William J. Petrowsky is mill superintendent.

MEXICO—J. D. M. Wardrope, mining engineer of Apatzingan, Michoacan, is doing some exploration work in the district, which, although primarily agricultural at present, is said to have potential mineral values, mainly in lead and copper but also in gold and silver. On the coast, Wardrope says that several iron deposits are the subject of some interested study. At Arteaga, which is a three-day horseback ride from Apatzingan, at least one placer mine is active. As plane service connects a good many of the smaller towns in the region, some hope is held that it will stimulate prospecting of the area.

BRAZIL—A deposit of reportedly highgrade iron ore has been found less than 125 miles from Sao Paulo in the Vale da Ribeira. The deposit is of particular importance because of its nearness to the Sao Paulo steel mills. Three important deposits of manganese ore have been found also. The first is at

Guacui, State of Espirito Santo; the second at Carrapato, Saude district, State of Bahia, and the last at Parreiras, Minas Gerais State.

MEXICO—Two more iron ore discoveries have been made, one near Aca-pulco in Guerrero and the other at Cerro del Cubero along the Michoacan coast, according to the National Institute for the Investigation of Mineral Resources. The Institute estimates that 15,000,000 tons of 67 percent iron ore is available in the latter deposit and large scale development is planned. The Institute also is investigating a report by Eduardo Aguila, mining engineer-geologist, that a 30-square-mile tract near Guanajuato City, Guanajuato, is richer in manganese, tungsten, antimony, tantalite and columbite than similar zones in Australia and the Belgian Congo.

ARGENTINA—In Catamarca, exploration is progressing at the promising gold mine, *Agua de Dionisio*. The mine is in a gold-bearing zone extending in length about 12 kilometers and considered the most important auriferous zone of the country, so far found. It was discovered by the National University of Tucuman. The *Agua de Dionisio* veins also show some copper and manganese.

MEXICO—Mining-law amendments intended to encourage the working of virgin areas and the resumption of work at old properties idle for 10 years allow the following discounts: Virgin—50 percent for the first two years, 30 percent for the next two years, and 10 percent for the fifth year; Old tracts after 10 years idleness—50 percent first year, 30 percent second year and 10 percent the third year.

Continued on Page 63



ECUADOR TO DEVELOP SULPHUR DEPOSIT

A new source of sulphur is to be developed in Ecuador near Tixán and Alausí on an Andean plateau 8,500 feet above sea level. A contract with Chemical Plants Corporation, a U.S. firm, calls for sulphur extraction, exportation, and conversion into sulphuric acid in a plant to be built in Riobamba. The sulphuric acid will be for domestic consumption. First sulphur shipments are expected by the end of the year. The pit area is connected to the river port of Guayaquil by a railroad and a nearly completed highway. U.S. help is being sought only for priorities on basic mining equipment essential to the operation. The developing corporation is an affiliate of Oscar Kohorn & Co., Ltd., international builders and operators of rayon plants.

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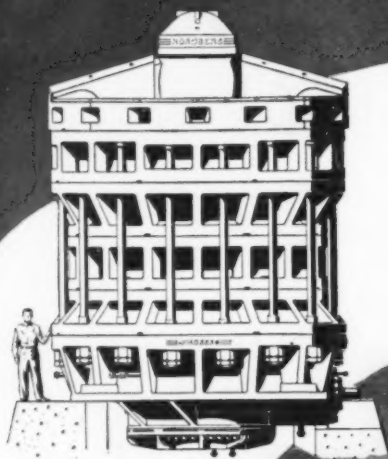
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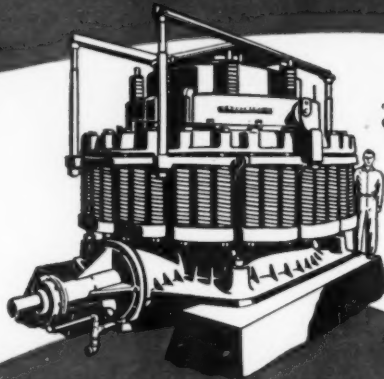
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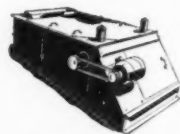
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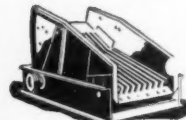
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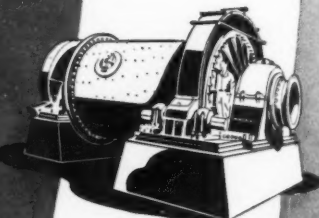
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Appleby Frodingham Steel Co., Ltd.
Balkan Mining Company
Bethlehem Steel Company
S. K. F. Hofors Bruk
Brazilian Steel Corp.
Butler Brothers
Cleveland Cliffs Iron Company
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Columbia Iron & Steel Corp.
Consett Iron Co., Ltd.
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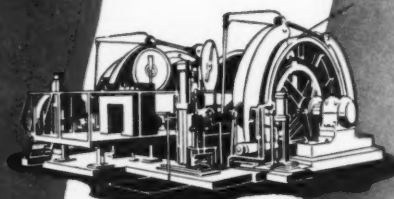
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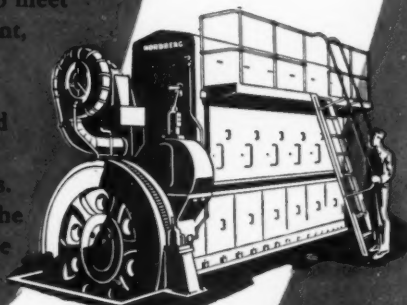
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INDIA—The deposit of sulphur recently discovered in Ladakh in Kashmir is reported to be under active investigation by the government of India in respect to its extent and quality. At present, India produces only about 10 tons annually, mined in Masulipatam, while its requirements run to about 50,000 tons a year. Reported discoveries of pyrite deposits are also being investigated to determine the amount of sulphur they contain and to estimate the extraction cost.

TURKEY—Ozdemir Maden Sirketi, which operates antimony mines at Turhal, is planning to expand its facilities and to build a flotation mill of 50-ton daily capacity.

INDIA—Diamond drilling at Balaghat mine, owned by the Central Provinces Manganese Ore Company Ltd., is almost completed and the drill rig will soon be transferred to another of the company's mines. An HMS plant is being planned for the Dongri Buzurg mine, which will be used to extract manganese ore from the old dumps.

TURKEY—Keciborlu sulphur mine, operated by the Eti Bank, will install a 100-ton-daily mill to treat sulphur by flotation. The average grade of the ore to be milled will be around 55 percent sulphur and 15,000 tons of concentrate will be produced per year. At present, the steam autoclave system is being used and, from selectively mined high sulphur, 4,000 tons of pure sulphur was produced during the first half of this year. The autoclave system will continue to produce sulphur for industry, while flotation concentrates will be sold to the farmers for agricultural use.

INDIA—Because of reduced copper imports, some miners in Bihar plan to produce copper on a commercial basis. They have floated the Nagari Mining Company Ltd. with a capital of 5,000,000 rupees and are understood to have made arrangements for foreign technical assistance. They have also completed prospecting in Pepsu and have obtained the necessary mining lease. The company hopes to begin operations soon. Another new company, Khasi Sillimanite Ltd., is to be registered shortly in Calcutta to mine deposits in Assam. Financed until now by Pilkington Brothers Ltd., Steel Brothers will be the managing agents for the new company.

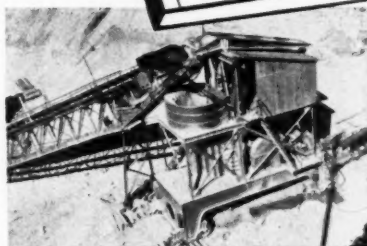
SUMATRA—The miners of the Lebong Tandai Goldmine (Simau) have requested that the government reactivate the mine, either on a private basis or under government supervision. The mine is still mostly flooded.

TURKEY—Promising chromium and copper deposits have been found in the province of Tokat and preparations are being made to develop them.

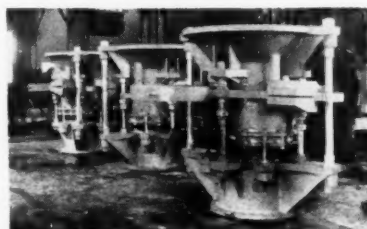
INDIA—India's mica exports nearly doubled in 1950 and 1951, making her again the world's top supplier of high-grade mica. The increase in production is due principally to the electrification of the mica areas in Hararibagh, Bihar, last year. However, difficulties in obtaining mining materials are said to be the rea-

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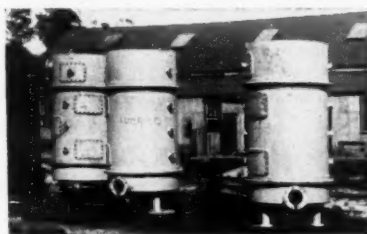
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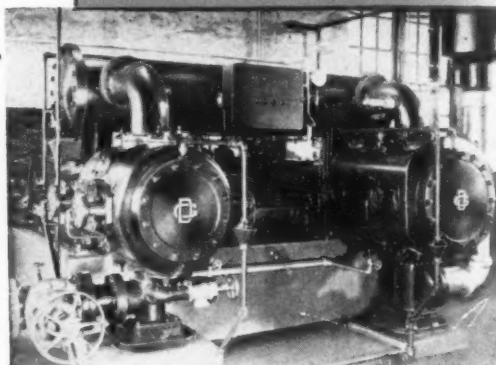
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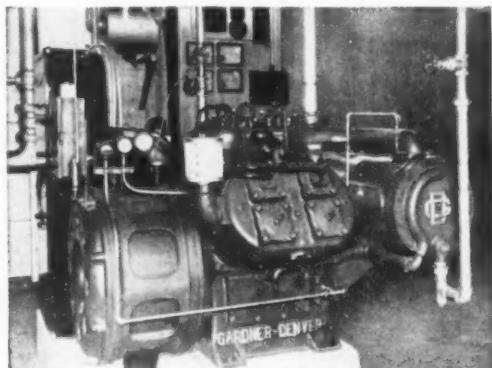


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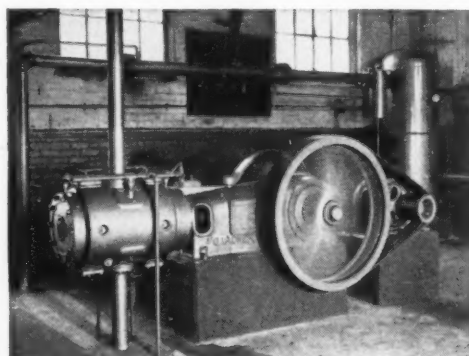
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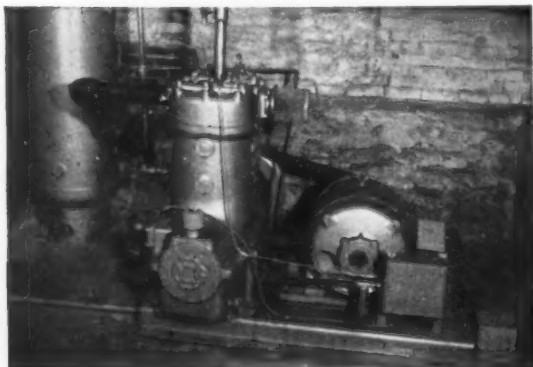
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INTERNATIONAL

FORMOSA, BURMA, INDOCHINA and THAILAND—The Economic Cooperation Administration has authorized Formosa to spend \$527,000 in U.S. grants before the end of the year on equipment for a copper and gold mining project. The equipment must be bought either in the U.S. and possessions, in Japan, in Germany, or in the United Kingdom, and terminal delivery date is December 31, 1952. ECA also authorized expenditures for construction, mining and conveying equipment by Burma, \$87,000; Indochina, \$345,000; Indonesia, \$2,000; and Thailand, \$214,000. Date lines were the same as above. Burma can buy in the U.S. and possessions or Japan; Indonesia in the U.S. and possessions, Japan, or France; Indonesia and Thailand in the U.S. and possessions.

INDIA—Central Provinces Manganese Ore Company, Ltd., is installing a 100-ton-per-hour Wemco Mobil-Mill with an 8x6-foot drum separator. Feed will be 5x3/16 inch. Specific gravity of the media will be 3.1 with 80 percent of the feed being the sink concentrate.



EUROPE

SWEDEN—An ore deposit containing manganese has been discovered at Borggårde, Høkhuvud, in southwestern Sweden. This area is close to the old Borggårde silver mine, where King Gustav Vasa began mining in the 15th century. The mining claims for this deposit have been taken out by the *Korsnäs AB* mining company.

WESTERN GERMANY—Another lead-zinc mine situated in the mountainous country of the Eifel, the *Silbersand* mine near Mayen which has been idle for more than 30 years, is now being investigated by *AG des Altenberg* and may be reopened if these investigations are promising.

ITALY—A new company, *Imprese Ricerche Endogene Mezzogiorno (IREM)*, has been organized in Rome to engage in mining, petroleum and natural gas research in southern Italy. Vittorio Montuoro is president.

DENMARK—The large mineral deposits discovered in Greenland in 1949 are being exploited by funds from the United States Economic Cooperation Administration. A technical assistance project has been approved which will take Carl Koch, a Danish mining engineer who will participate in the Greenland enterprise, on a tour of U.S. lead and zinc mines to study American mining techniques and machinery.

HUNGARY—A deposit of about 100,000,000 tons of magnesite is reported to have been discovered in the Matra Mountains. A smelting plant will be erected in Miskolcz with machinery and equipment to be imported from Russia.

BULGARIA—The Bulgarian government has announced that during the first five months of 1951, the Bulgarian zinc ore output reached 15,610 tons, as compared with 12,670 tons during the same period of 1950. Negotiations are in progress

to import a smelting plant from the *Skoda Works* in Czechoslovakia to increase the output of zinc metal in Bulgaria.

CZECHOSLOVAKIA—A new uranium mine has reportedly been opened at Hermanovv Seisy near Jachymov, Czechoslovakia. Jachymov is said to be the site of the largest uranium mine behind the Iron Curtain.

SPAIN—The Spanish National Institute of Industry has created a sub-organization to investigate the possibilities of exploiting new pyrite mines in the province of Huelva. At the same time, a plant will be built which will produce 150,000 tons per year of sulphuric acid, and a metallurgical plant will be opened to treat the burned pyrite ashes in order to recover copper, silver, and gold.

PORTUGAL—Three Portuguese firms have signed agreements with the *United States Economic Cooperation Administration* which will provide them with the necessary equipment to expand and to speed up their mining operations. The U.S., in turn, will be repaid in shipments of wolframite which will be used for stockpiling purposes. The contracts were made with *Minas de Cerca, S.A.R.L.*, which received an advance of 1,500,000 escudos (about \$51,000); *Sociedade das Minas do Gerez, Lda.*, which received an advance of 3,000,000 escudos (about \$102,000); and *Mineira Gouveense, Lda.*, which calls for an advance of up to 500,000 escudos (about \$17,000).

BRITISH ISLES—Two old Cornish mines near Land's End, about three miles from Geevor, may be reopened. The properties, *Wheal Bellan* and *Wheal Hermon*, have not been worked since 1890 and 1878, respectively, although during World War II *Wheal Bellan* was

partly reopened for examination. A South African firm is reported to be investigating the area and may carry out exploratory work. The prospects are thought to be good, particularly on the portions of the lodes which extend under the sea and have not been worked. A fluorspar mine, *Old Heights* mine, in Weardale, Durham county is also said to be reopening. In North Wales, *Halkyn District United Mines* whose property covers about 8,000 acres in Flintshire, is producing again and has been carrying out exploratory work for some time. Some modifications have been made in the treatment plant at *Geevor Tin Mines Ltd.* in Cornwall. A Hardinge mill and tables in the middling regrind circuit have been installed. At *South Crofty* mine in Cornwall, development is going ahead on the *Complex* lode, carrying both wolframite and tin, which is located in the bottom of the mine.

SPAIN—Because of an American loan, managers of the *Almadén* mines have concluded a deal with a large U.S. metallurgical equipment manufacturer for the complete installation of a mercury furnacing plant. A daily production capacity of 200 tons is expected from the new facility.

ITALY—The new zinc processing plant at Gorno, Bergamo Province is nearly completed. Total capacity will be 18,000 tons of zinc ingots yearly, and operations are scheduled to begin in 1952. At that time Italy's output of zinc ingots will be 70,000 tons, about half of which will be exported.

SWEDEN—The *Boliden A. B.* mining company's new iron ore concentrating plant under construction at Boliden will be comprised of two sections, one for the treatment of Renström ore and the other for the other ores of the Boliden area.



FRENCH IRON MINE MECHANIZED

At the old Heydt Redange openpit iron mine near Nocke, France, mechanization is slowly underway and about 900 to 1,000 tons of iron ore is mined now every 16-hour working day. Overburden is stripped with an electric shovel of 2.29-cubic-yard capacity and loaded into 5.23-cubic-yard-capacity railway cars which are hauled by electric locomotives. The Caterpillar Diesel D8 tractor with a No. 8A bulldozer in the picture is spreading overburden dumped by the railway cars. The ratio of overburden to iron-bearing material is about 50-50. The pit, consisting of about 28 hectares of which 10 have been mined out, has an estimated reserve of approximately 1,000,000 tons of ore.

INTERNATIONAL

The first section will be finished in late 1953 or early 1954, and the second a year later. Cost is estimated at a maximum of about 20,000,000 Swedish kronor. The plant's dimensions will be: 100 meters long, 80 meters wide, 73.5 meters high, and a 90 meters deep shaft, which has been blasted out underneath the plant. The company will start mining iron pyrites at Rudjebäck, Mala, on land owned by the state next year, and also will start construction of a new concentrating plant there next year. Boliden's experimental mining of lead at Lövstrand, Dorotea, will be continued for the next three years since the area is large and the deposits of lead varied. The company also is considering exploiting iron pyrites discovered at Ringvassöya, north of Tromsø, Norway. Besides iron, the ore contains gold and other minerals.

UNITED KINGDOM—One of Britain's most serious shortages—steel sheet and

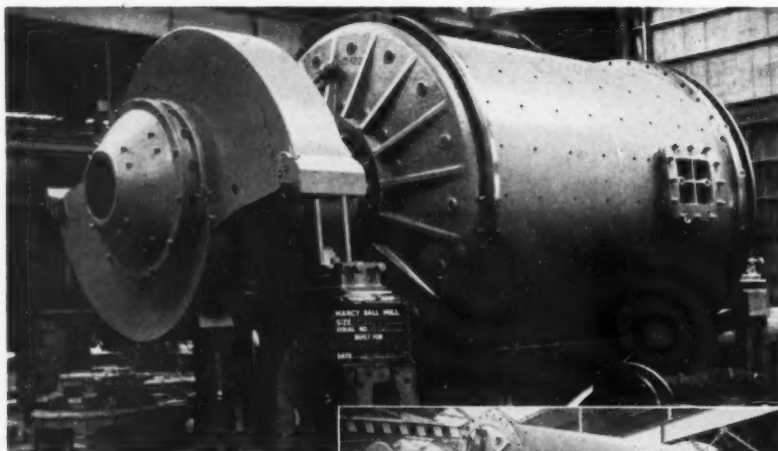
tinplate—should be eased as a result of the opening of what is claimed is the most modern steel works in the world, The Abbey Works of the Steel Company of Wales at Margam. The Works were built at a cost of £60,000,000 and cover 550 acres. The iron ore used comes from Sweden, Spain, Africa, France, Newfoundland and Yugoslavia. The weekly production of steel strip and plate will be about 22,800 tons.

POLAND—A second open hearth furnace has been started at the new steel factory at Czesochowa.

FRANCE—Monthly production of aluminum has risen since March from 5,200 tons to 7,500 tons, and consequently the production of bauxite has risen from 83,000 tons to 96,500 tons. Monthly production of lead, about 4,550 tons, and of zinc, about 6,750 tons, is still far from satisfying the needs of the country.

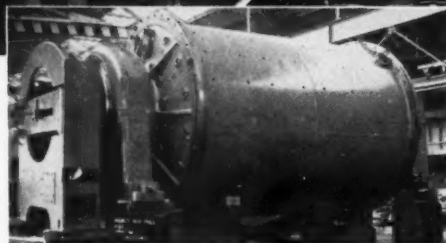
ENGLAND—The Tin Research Institute, financed by six of the leading tin producing countries in the world, is one of the most comprehensive international research organizations that private enterprise has produced. Now, the new laboratories have been opened at Greenford and the work of research and development for new and improved methods of tin usage will be able to go faster. On display at the laboratories are several processes developed by the Institute. One is a process for tin-nickel plating which is a simple one-coat process needing no chrome. Little or no finishing is required, and, as the plating alloy contains only 35 per cent nickel, platers hit by the severe shortage of the latter are keenly interested. Two other plating processes employing tin are already in commercial use, though capable of considerable expansion. One is tin-zinc plating using 78 per cent tin. The other process is "speculum" plating where the surface consists of an alloy of 40 per cent tin and 60 per cent copper.

MARCY LOW-PULP-LINE MILLS GRIND TACONITE



The only large magnetic separation pilot plant now in operation on taconite ore utilizes Marcy low-pulp-line grate discharge ball and open-end rod mills. During test operations various types of grinding problems have been worked out in the pilot plant, including single- and two-stage grinding, as well as varying fineness of finished product, to extremely fine meshes, with these Marcy Mills. Another large pilot plant utilizing Marcy Mills is now under construction.

Like other Marcy Mill installations on various ores, these pilot plant mills are proving their high capacity and grinding efficiency, due to rapid circulation of mill contents. In a Marcy Mill there is less overgrinding, better utilization of power, lower cost per ton of ore ground.



Shop photos of the Marcy Mills designed for the pilot plant mentioned.

Our Marcy engineers are available for consultation on any grinding problem. If you have use for milling and metallurgical equipment, write for Catalog No. 108-B, completely revised and up-to-date.

Other MASCO products: Massey-Fahnestock Plotation Machines, Gosselot Wilfley Tables, Monac-McCarthy Hot Millers, Rock Bit Grinders, Density Controllers, Belt Feeders, Rubber Pinch Valves, Assay and Laboratory Supplies and Equipment, Complete Milling Plants.



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AFRICA

ALGERIA—The average monthly production rate of iron ore during the first months of 1951 was 233,000 tons. This was equivalent to production in 1938 and 1939, the best years before the war.

SOUTHERN RHODESIA—Directors of *Bushtick Mines (1934) Limited* have decided to close down because of the failure of the native labor supply and continued rise in cost structure. Development at the *Killarney* and *Hibernia* prospects in the Filabusi district, however, will continue. The new *Killarney* shaft was sunk 53 feet to a depth of 531 feet.

SOUTH AFRICA—The foundation stone of the new Vierfontein Power Station, to be built at a cost of £11,000,000, has been laid recently and construction is under way. Planned to be eventually the biggest power station in the Southern Hemisphere, it will provide electricity for the Free State goldfields. Initial capacity will be 210,000 kw, with possible extension to 300,000 kw. The station is located in the middle of a coal field, 60 miles from the goldfields and about 20 miles from Klerksdorp.

SOUTHERN RHODESIA—Mechanization has increased asbestos output per man by 50 percent, while the market value of the fiber is rising steadily. In the first five months of 1951, output totalling 31,808 tons was valued at £2,157,000—an average of nearly £68 per ton. In 1948, the year's total production of 68,896 tons was valued at £2,604,623—an average of less than £38 per ton. The increasing demand for asbestos is luring many mining groups. In the Bulawayo district, over 140 asbestos properties are now registered and output is valued at nearly four times that of gold.

SOUTH WEST AFRICA—*Diamond Mining and Utility Company (S.W.A.) Limited*, has secured exclusive rights to prospect *Diamond Area No. 2* for three years, except where claims already exist. An agreement has been signed with *Industrial Diamonds of S.A. (1945) Limited* for immediate exploitation of this area.

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*Trade-mark of Harnischfeger Corporation for electro-magnetic type clutch.

Here's another team of P&H Electric Shovels at work on the Mesabi Range. They're owned by a prominent mining company at Virginia, Minnesota. At left is a P&H Model 1400 (4 cu. yds.). At right is a new P&H Model 1055 Electric Shovel (3 cu. yds.) which incorporates all of the famous P&H features.

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TANGANYIKA—A general summary of mineral exports during January to May 1951 shows a drop in total value as compared with the same period in 1950. In 1951, the total value was £583,809; in 1950, £733,012. However, comparisons for the month of May during both years show a substantial gain in 1951. The value of mineral export for May 1951 was £91,959; in May, 1950, £90,741.

SOUTHERN RHODESIA—A Johannesburg, South Africa, mining and finance corporation is reported to have taken up a short-term option to purchase the *Salis* asbestos mine owned by G. Salis of Selukwe. The mine is on the Donga farm 17 miles from Selukwe, and the purchase price is said to be in the five-figure class. The corporation is to start exploration and development work immediately. If results are as satisfactory

as is hoped, the development of the mine may compensate the township for the early closing of the *Wanderer* mine.

SOUTH AFRICA—*African Interests* has acquired a 70 percent interest in some manganese property 54 miles from Johannesburg, in the district of Krugersdorp. The area has been under test for some months and payable manganese ore of between 36 and 43 percent is said to have been proven. Production has begun and a minimum of 1,500 tons a month is expected soon.

NIGERIA—The chairman of *Bisichi Tin Company, Ltd.*, reports that during 1950 the company produced 120 tons of columbite concentrate averaging 73 percent Cb_2O_3 , an increase of 51 tons over the previous year. In the first five months of 1951, 71 tons were produced, or two

tons more than in the corresponding period of 1950.

SOUTHERN RHODESIA—*Grand Parade Associated Mica Mines, Limited*, currently investigating the other base minerals in its district, reports that beryl appears to be the most profitable at the moment. One of the biggest obstacles to development is the lack of adequate transportation facilities. It is estimated that thousands of tons of scrap mica lie deteriorating because of high transportation costs.

SOUTH AFRICA—Plans for the erection of £45,000 worth of machinery and the establishment of a large mining undertaking on the farm Dyasonsklip, about 15 miles from Upington have been reported. Rich tungsten reefs are said to be located on the property which has only

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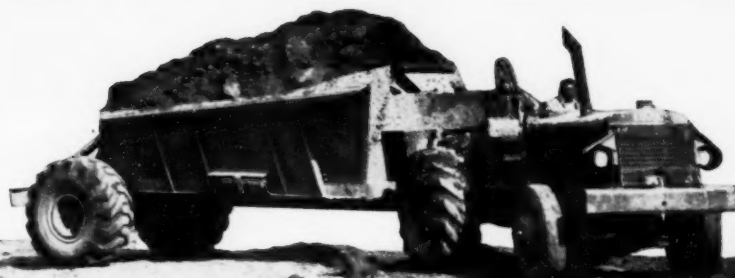


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INTERNATIONAL

GOLD COAST—Marlu Gold Mining Areas, Ltd., operating on the Prestea Ashanti line of reef, reported that its new plant being erected to treat the sulphide orebody should begin operating at partial capacity by the end of the year. Total capacity of the plant is 4,500 tons monthly. The company hopes to maintain an output of 45,000 tons of ore monthly mined from the oxidized zone. In the year ended September 30, 1950, the chairman, Major-General W. W. Richards, said that 90,000 tons more ore was milled in that year than in 1949. Reporting on plans over the next two years at Amalga-

ated Banket Areas, Ltd., Major-General Richards, who is also chairman of this company, said the company hoped to produce from 40,000 to 45,000 tons of underground gold-bearing ore per month (compared with the present production of 20,000 to 24,000 tons) and from 15,000 to 20,000 tons of surface ore from the Pepe property per month (compared with 24,000 to 30,000). He said underground ore was much more profitable. The company mines in the Tarkwa area and the Central Mill on the property has a capacity of 60,000 tons of ore monthly.

SOUTH AFRICA—The Premier Asbes-

tos Mines Ltd. is another company becoming involved in diversified interests. Besides its recent lease on an asbestos mine in the Pietersburg district, which has been producing for two years and now averages about 60 tons of amosite fiber monthly, the company has an option on the La France gold mine, in which an estimated 30,000 tons of ore may be available, retains a 15 percent interest in prospecting contracts over areas in the Potgietersrust district with Kennecott-Anglovaal Exploration Company, and has an agreement with the Anglo-Transvaal Consolidated Investment Company over 3,200 base metal claims in the Gravelotte district.

SOUTH AFRICA—The African American Gold & Mineral Corporation, Ltd., has taken an option on the farm Vellefontein No. 1334 in the Warmbaths district, Rooiberg area, in order to prospect for tin. Rehabilitation and dewatering of extensive old workings is in progress.

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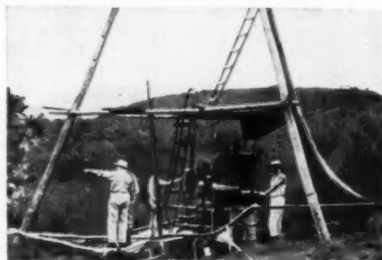
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LONGYEAR contract drilling crew prospecting for iron deposits in Venezuela.



Exploring for iron ore in Canada with a LONGYEAR UG Straitline Drill in 1950.



OCEANIA

VICTORIA—The Amphitheater dredge owned by Central Victoria Dredging Company N.L., is in operation, opening out a dredging pond to bedrock. One-shift operation is being worked at present, and extra shifts will be worked as soon as practicable.

QUEENSLAND—Broken Hill South Ltd., one of the large Broken Hill (N.S.W.) mining companies, is diamond drilling a 300-acre area at Mt. Oxide. Wolfram Tin Pty. Ltd. has been examining 400 acres at Stanthorpe and has now installed a pilot plant.

NORTHERN TERRITORY—Imperial Gold Mines N.L. has taken an option on a group of leases (scheelite-wolframite) near Hatches Creek and will form a new company called Imperial Scheelite N.L. About 125 miners are now working the field, which is 100 miles southeast of Tennant's Creek. The area yielded £20,000 in the April crushing at the Commonwealth government's battery.

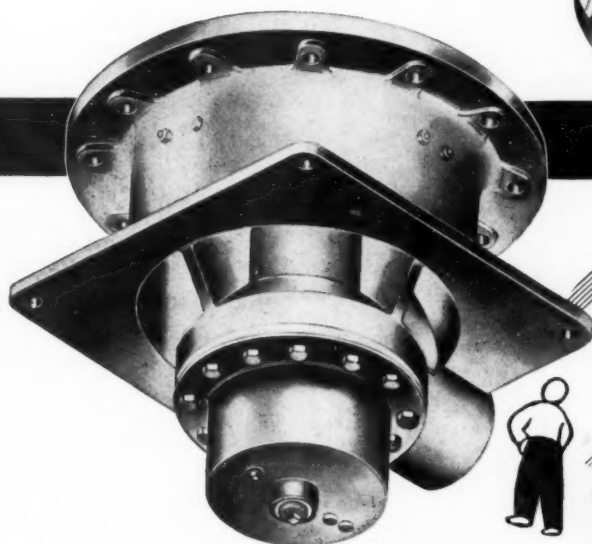
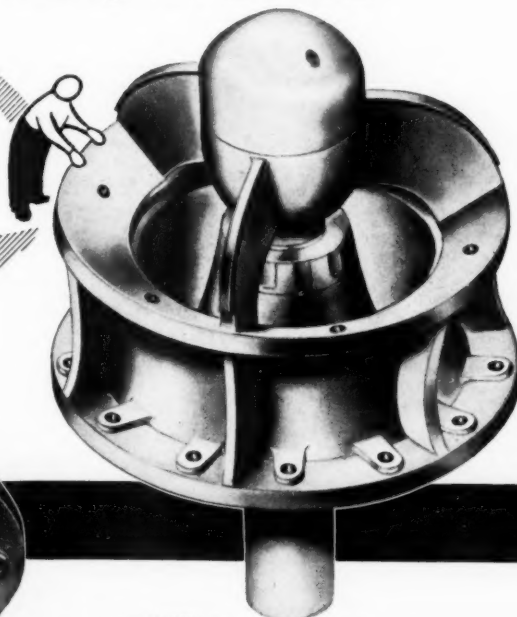
SOUTH AUSTRALIA—Vacuum de-zincing of lead will replace the air oxidation method presently used at Broken Hill Associated Smelters Pty. Ltd., Port Pirie. The company treats the Broken Hill (N.S.W.) mines' output of concentrates, producing refined lead at the rate of 500 tons per day. Updraft sintering on a Dwight-Lloyd pilot plant machine has given such good results—11,000 tons of sinter has been made—that a larger machine is to be designed to increase sulphur dioxide production for the manufacture of sulphuric acid.

VICTORIA—Morning Star (G.M.A.) Mines N.L., which has been diamond-drill testing at Loch Fyne, has released its option because only veins of low metal content have been intersected.

WESTERN AUSTRALIA—Norseman Gold Mines N.L. is regularly treating 6,000 tons of ore per month, from which about 3,000 tons of pyrite is recovered. About 1,000 tons per month of selected ore is being shipped to manufacturers of acid. A new company, Western Shaw Gold N.L., has been formed in Adelaide to work alluvial gold areas west of the Shaw River.

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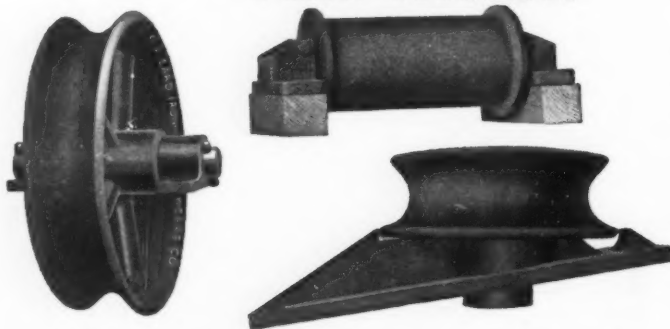
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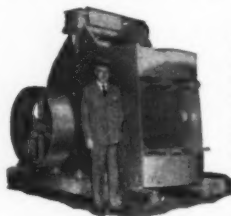
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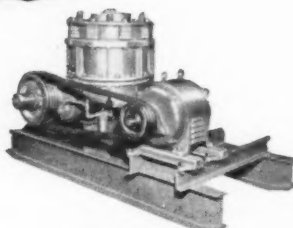
The exclusive principle of "crushing without rubbing" gives users 5 to 10 times longer jaw plate life. A few of the other features include all mechanism sealed in oil bath. Lubricate twice a year. Automatic overload safety device without shearing or breaking parts. High capacity with low power requirements.

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Only 60 H.P.
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PHILIPPINES—A \$2,500,000 electric steel mill is to be purchased by the Philippines government and installed on its southern-most island, Mindanao. Upon completion, the mill will turn out more than 75,000 tons of finished and semi-finished steel annually.

NEW SOUTH WALES—Diamond drilling by the *New Occidental Gold Mines, N. L.*, in the once famous Great Cobar lode has intersected a copper ore-body at a depth of 2,570 feet with the drill still in ore after traversing a true width of 15 feet. Exploratory drilling by *Point Lookout Antimony Mine Pty., Ltd.*, has disclosed 15,000 long tons of nine percent ore.

NEW GUINEA—*New Guinea Goldfields, Ltd.*, has started up the amalgamation section of its new mill at Golden Ridges near Wau. This section probably will be in full production before the end of June. Tailing will be cyanided but is being stored until the cyanidation plant has been erected.

QUEENSLAND—Interest continues in the Mt. Carbine tungsten field near Cairns on the northern coast and approximately 50 men are now said to be working in the area.

NEW SOUTH WALES—*Silverton Silver Mines, N. L.*, has treated 30 tons of dump material from the *Umberberka* silver mine, Broken Hill, by cyanidation for a recovery of 72.5 percent of assayed head values—4.16 fine ounces or 34—a ton. Operating costs were 14/6 a ton. The company estimates available ore at 40,000 tons.

VICTORIA—*Gold Prospecting & Developing, N. L.*, has been boring a gold-dredging area in Gippsland on which an option is held. The area cannot be economically worked at present gold prices, however.



NORTH AMERICA

CANADA—Increased financial assistance recently authorized by the Canadian government to the mining industry will add \$700,000 to the 1951 expenditures, which now total about \$11,200,000. The amendment under which the increased payment is paid is based on giving the mines the option of using 1948, 1949, or 1950 as their base year for computing cost aid.

NEWFOUNDLAND—Under an agreement with the Newfoundland government, *Frobisher Ltd.*, the big eastern Canadian mining concern, has been granted exploration and development rights over 6,400 square miles in Labrador and Newfoundland. (The latter has territorial rights over Labrador.)

YUKON TERRITORY—*Cassiar Asbestos Corporation* is starting a development program at an asbestos property, 90 miles southwest of Watson Lake. The area was under option to *Conquest Exploration Company, Ltd.* which has assigned its option to Cassiar. It is reported that \$1,500,000 will be spent on the program.

MONTANA—A 100-ton silver-lead-zinc flotation mill is being constructed by *Trout Mining Division of American Machine & Metals, Inc.*, at its Philipsburg property where manganese dioxide is be-

Continued on Page 75

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Operators have long awaited the greater handling ease and comfort now brought to them by this new line of Allis-Chalmers tractors.

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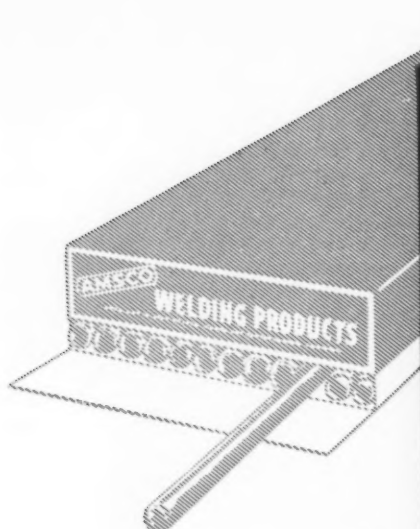
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40.26 drawbar hp.
11,250 lb.

HD-9
70 drawbar hp.
18,800 lb.

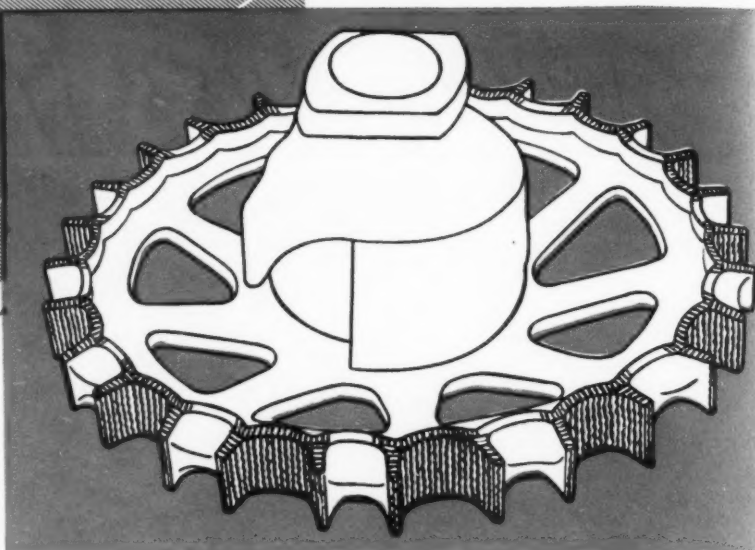
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27,850 lb.

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Hydraulic Torque Converter Drive
175 net engine hp.
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INTERNATIONAL

North American News

Continued from Page 72

ing produced in a magnetic concentrator. The new plant is expected to be in operation by the end of this year, according to L. B. Manning, general manager. Roy Hamilton, superintendent of the manganese dioxide concentrator, is in charge of construction.

UNITED STATES—Sulphur production in the first six months of 1951 amounted to approximately 2,692,000 tons. Although this is a record production it still is 20 percent under demands.

NORTHWEST TERRITORIES—*Pine Point Mines* drilling project for this year will total 45,000 feet with six diamond drills in service on the south shores of Great Slave Lake. The company is backed by *The Consolidated Mining and Smelting Company of Canada and Ventures Ltd.* "The Northern Miner" estimates that it would be necessary to prove the existence of 10,000,000 tons of six percent lead-zinc ore before production plans at an initial rate of 2,500 tons per day are made. If production is feasible, a railway extension and a major hydro-electric power development would be necessary.

QUEBEC—At its *Jeffrey* mine at Asbestos, the *Canadian Johns-Manville Company* plans to sink a second big operating shaft, to take five years to complete to a depth of 1,400 feet. The present main shaft also will be enlarged. The purpose of the work is to change over from openpit to underground asbestos mining. Production of ore, now being increased from 6,000 to 10,000 tons daily, will remain at the latter figure.

MICHIGAN—With iron ore from the *Gogebic* and *Marquette* ranges being added to the usual *Menominee* range shipments to its docks, Escanaba, Michigan may set an all-time record this season for tonnage of ore shipped. Shipments from the port on August 1 were 1,000,000 tons over last year's as of that date. Shipments from Ashland, Wisconsin, docks, on the contrary, were about one half those of 1950. Total shipments from Lake Superior ports on August 20 were 54,073,126 tons, over 12,000,000 tons ahead of that date in 1950.

BRITISH COLUMBIA—At Spillamacheen, *Giant Mascot Mines*, which has stepped up production of its No. 1 ball

mill to a new high of 180 tons daily, now is preparing to install a second ball mill with the objective of treating 300 to 350 tons daily. Metal recovery (silver-lead-zinc) is running 96 percent.

NORTHWEST TERRITORIES—Production and an exploration and diamond drilling program began in August at the *Outpost Islands* tungsten mine of *Tungsten Corporation of Canada Ltd.* at Great Slave Lake. The company's newly equipped mill, of 100-ton-daily capacity, is expected to operate through the winter at a 50-ton-daily rate treating ore from a stockpile now being built up. Before tungsten milling began, the company salvaged enough copper-gold concentrate from the mill to ship 200 bags to AS&R's Tacoma smelter. The drilling is in the No. 2 shaft area where previous drilling showed the extension of surface ore zones. The best place for finding large tungsten orebodies is thought to be under Great Slave Lake.

IDAHO—*Idaho Mining Company* (formerly *Washington-Idaho Mining Company*) has started work at its *Moon Gulch* property near Kellogg, Idaho, under its \$123,738 lead-zinc exploration contract with the U.S. Defense Minerals Administration. The project calls for rebuilding the shaft head frame destroyed by fire and drifting 500 feet on a 300-foot-level ore structure. If results justify, the shaft would be deepened 200 feet and 1500 feet of crosscutting and drifting done on the new level. Bruce E. Allgaier of Kellogg is resident manager. Wellman A. Clark, Spokane, Washington, is secretary.

ARIZONA—The *Athletic Mining and Smelting Company*, Klondyke, Arizona, has completed repair work at the Arizona shaft to a depth of 569 feet, and expects to begin core drilling from the bottom of the shaft very shortly. Production is averaging 150 tons of ore daily, 120 ton of milling ore being mined at the *Head Center* and *Iron Cap* mines, and 30 tons of direct shipping oxide ore from the *Grand Central*. Mill heads run from 2.0 to 3.0 percent lead and 3.0 to 4.0 percent zinc from which concentrates running 65.0 percent lead and 62.0 percent zinc are produced. Fifty men are employed under the direction of Harvey L. Horton, general manager, Safford, Arizona.

SASKATCHEWAN—*Elderado Mining and Refining (1944), Ltd.*, expects to

start producing uranium ore from the *Ace* property at Beaverlodge Lake in 1953. Work to be done to prepare for operation includes sinking a new shaft, 4,000 feet from the *Ace* to open the *Fay* zone. The *Fay* shaft will be sunk to 1-100 feet, will open six levels and will be the main production opening for both the *Fay* and *Ace* zones, with a hoisting capacity of 2,000 tons daily (initial production will be 500 tons daily). The two

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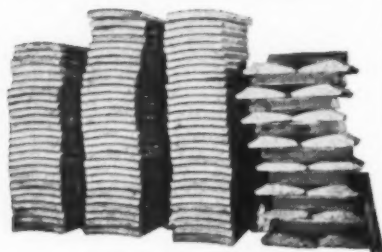
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shafts will be joined on the sixth level. Developing of east and west ore bodies on five levels off the Ace shaft is planned. A mill and equipment will soon be ordered. At the company's *Port Radium* mine, Great Bear Lake, the new leaching plant for tailing treatment will start operating early in 1952 and production will rise correspondingly from this property. Development has been mainly on lower levels in this mine and further development is planned so as to determine the location of an internal shaft.

ONTARIO—*Kerr-Addison Gold Mines, Ltd.*, Canada's leading gold producer, continues to find rich ore, and during its present drilling program from the deepest level at 2,650 feet and just above it, one drill hole returned 1.01 ounces across a core length of 47 feet, another hole about 75 feet away assayed 0.974 ounces across 55 feet in the No. 21 vein, one of two main orebodies. Drilling in the No. 6 vein, the other main orebody, gave an assay of 1.27 ounces across 12 feet in one core. Shaft deepening to 4,025 feet will be completed this month and 1,000 feet of crosscutting on the new low level at 3,850 feet is planned plus east and west drifts. Total ore reserves at the end of 1950, which do not include present discoveries below 2,050 feet, were 14,436,389 tons. Most of production comes from the 1,300 foot level and above and in May a record daily average of 4,447 tons was milled. The mine is at Virginiatown. W. S. Row is manager.

ALASKA—*The Zenda Gold Mining Company* has received a DMA loan of \$54,000 for exploration drilling of a tin-bearing placer deposit on the Seward Peninsula.

NORTHWEST TERRITORY—*Glant Yellowknife Gold Mines* will spend about \$1,500,000 before its present development and construction program is completed at Yellowknife. The present mill capacity will be doubled to 700 tons daily; 10,000 feet of continuous north-south mine workings are planned; and a fourth shaft eventually will be sunk. On the 750-foot or bottom level of the new C shaft, the central ASD zone has been drilled at 100-foot intervals and to date has shown a continuous ore length of 1,300 feet to the north. The A shaft will be deepened to 750 feet. The B shaft has been connected to C at the bottom level and the A shaft also will be connected to them later on. Production is coming from the B zone now but eventually C will be the main hoisting shaft. At present about 70 tons of development ore is hoisted daily from the ASD zone through the C shaft.

BRITISH COLUMBIA—A Canadian tunnel-driving record is claimed by the *Miners Western, Ltd.*, for a day's work in cutting a 2½-mile tunnel for the British Columbia Power Commission's new hydro-electric installation in the Whatshan and Lower Arrow Lake district. The horseshoe-shaped tunnel is 12 feet high and 12 feet wide at the base. An average of 42 feet per day was made through 1101 feet of rock, and on the record day 54 feet were driven.

CANADA—The Canadian Metal Mining Association reports that about 2,000 Europeans will have been hired for work in Canadian mines by September 15 this year, and the *Hollinger Consolidated Gold Mines* has hired Scottish fishermen for work in its Ontario mines. Inexperienced men are preferred. V. C. Wansborough, managing director of the association, said, since they must be trained to Canadian methods anyway.

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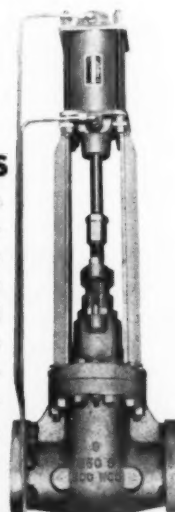
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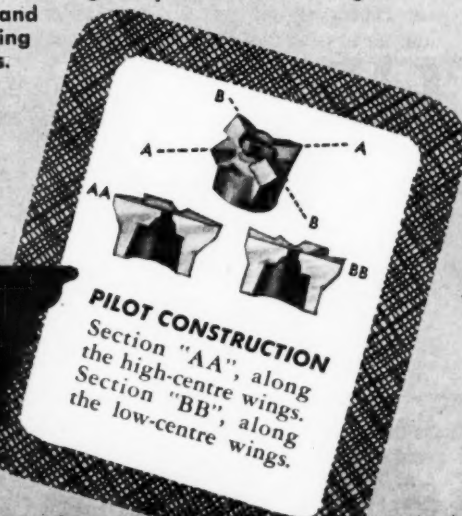
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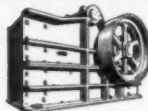
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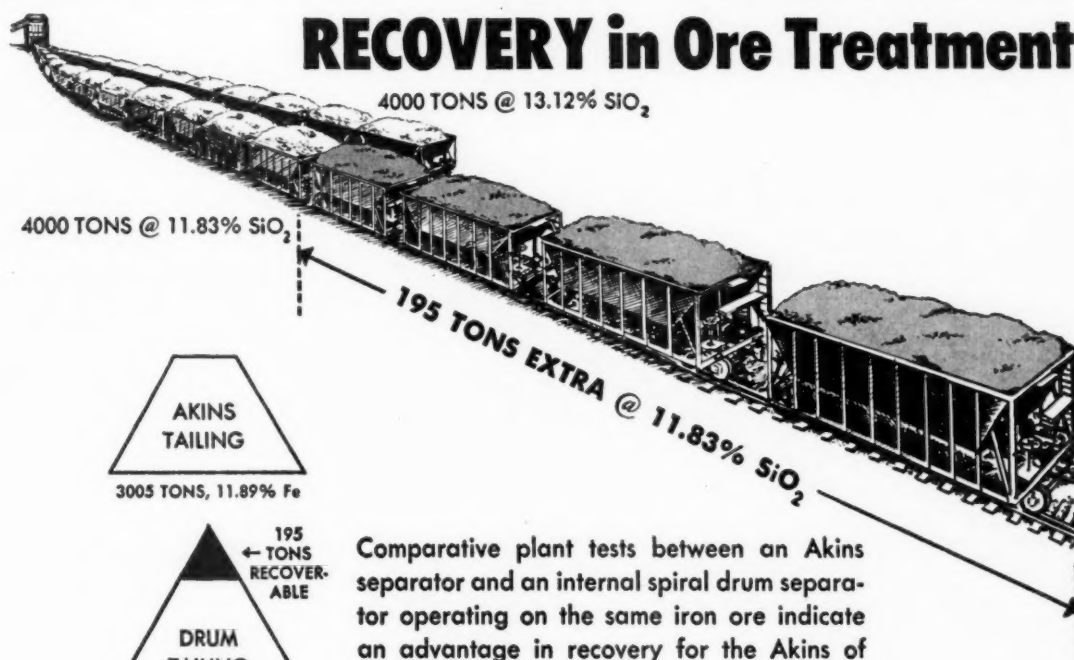


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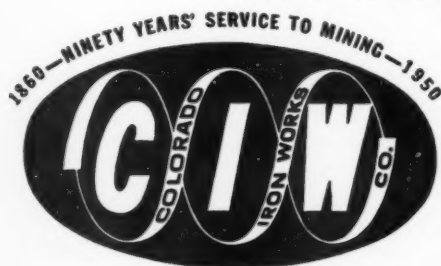
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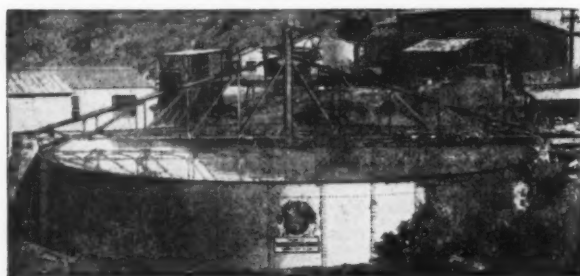


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The most important periods in the lifetime of a crane or shovel come when they are first placed in service, and the period immediately following when the customer is becoming accustomed to the machines. Proper instruction covering all adjustments, care and points of lubrication is important at the time of delivery. Since there will always be a labor turnover, it is essential that operating instructions be handed down from one operator to another in the event that the employee originally familiar with operating instructions leaves for another job.

Systematic care and maintenance can usually be developed by following carefully the manufacturer's operating and instruction manuals. This includes not only proper care and lubrication, but also keeping the machine clean, and making regular periodic inspections of the equipment—inspections which will reveal necessary normal adjustments, and which will assure the proper replacement of parts at the right time.

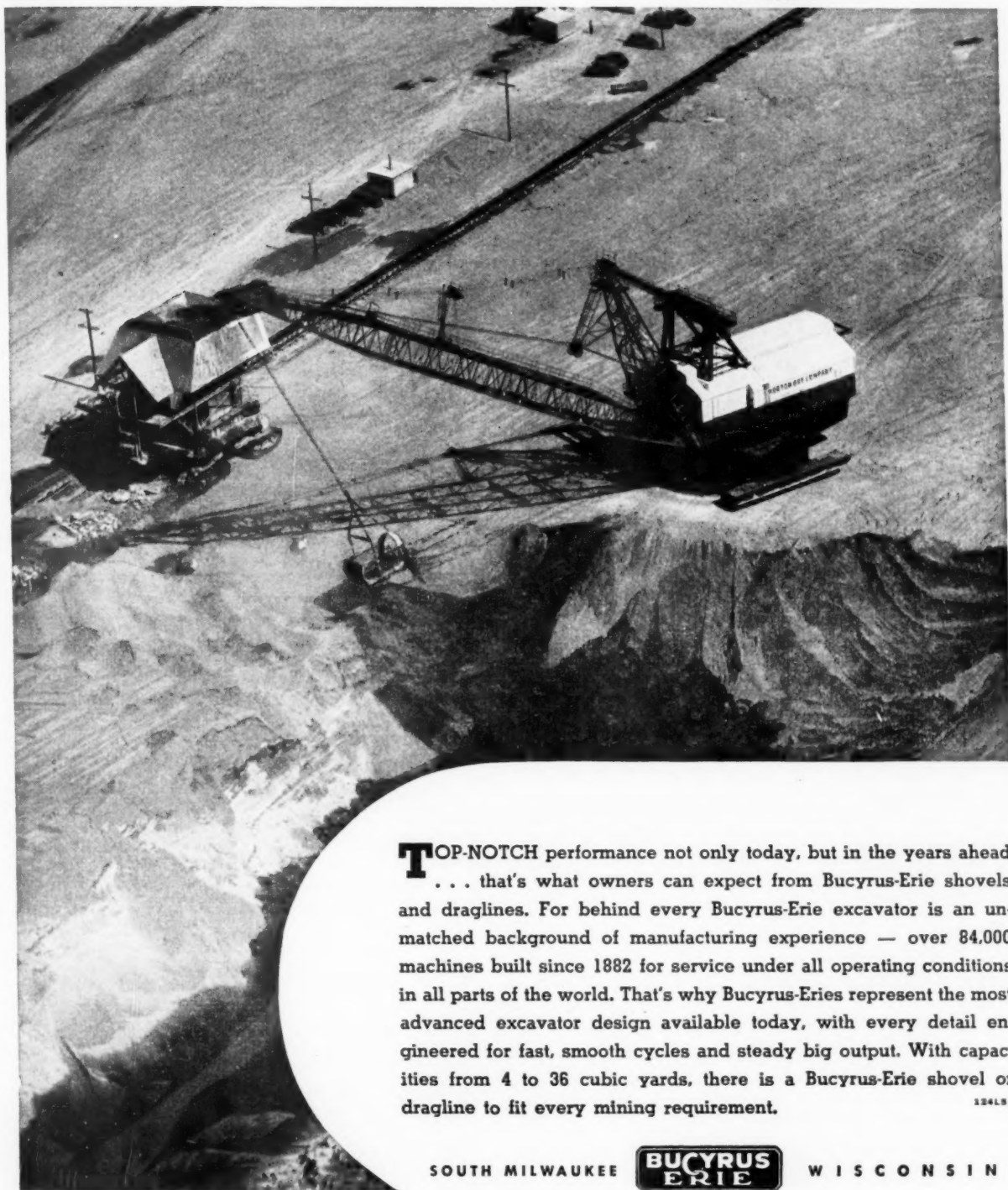
Lubricants, motor oils and greases should conform to manufacturer's recommendations, and should be products of reputable firms. Regular intervals of lubrication will eliminate the "guesswork" concerning the number of hours worked. Manufacturer's charts on seasonal changes in viscosity should be followed closely. One important detail to remember is the periodic examination of lubrication tubes. Too often it has been discovered too late that a grease tube has failed or become clogged, and that grease was not reaching its intended goal. When that happens, some bearing will fail for lack of grease, which may also result in damage to a shaft or other important part.

Clutches should be inspected closely to make sure they are maintained in good condition and adjustment. It should be determined whether or not the clutch is wearing properly. Linings should be examined closely and kept clean and free from grit and other foreign particles to eliminate scoring of drums. Center pins should be checked and tightened as needed. Drive chains should be kept in adjustment, and sprocket chains examined for undue wear. Bushings should be watched to avert shaft scoring. Engine filters must be changed at specified intervals to safeguard the power plant of the machine.

Good maintenance also entails the advance ordering of needed parts. Many parts, such as linings, cables, dipper and bucket teeth, and the like, are essentially wearing parts, and must be replaced periodically.

Periodic cable inspection is vital in all machines. A frayed cable should be promptly replaced, particularly if it is a load-carrying cable. Although it may be subjected to little actual running wear, the boom hoist cable—which is a load-carrying cable—also should be inspected frequently, since its failure could well result in serious damage or even personal injury. In these inspections, all cable connections should also be checked.

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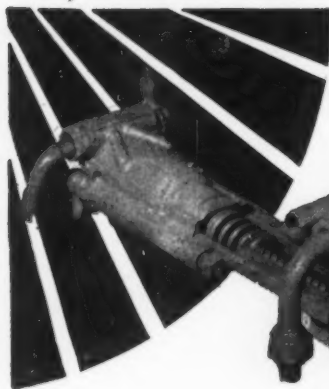
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OCTOBER, 1951

[World Mining Section—55]

83

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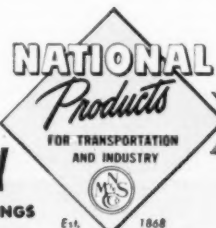
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Leading producers of metallic ores the world over depend on soundly-engineered S-A Bulk Materials Handling Equipment for many types of conveying. You, too, can benefit by S-A's 50 years of experience . . . and complete line. An S-A engineer will gladly review your needs for a new system—or additions to your present equipment. Write us.

MODERN IRON MINE

Three 36" wide S-A Belt Conveyors are located in the main tunnels at the 1100-foot level. Shaker conveyors and drag line scoops move the ore from the side drifts to the 1415-foot long belt conveyor system. The belt conveyors move ore to a large ore pocket where it is stored until drawn off by the mine skip-hoist bucket which picks up ore below pocket and elevates to the surface.

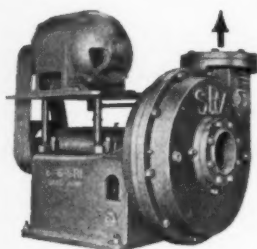
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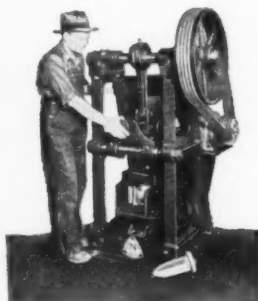
DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT



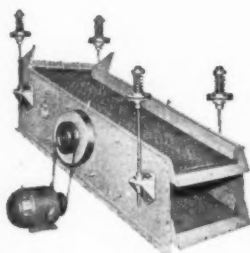
Denver Vertical Sand Pump



Denver SRL Sand Pump

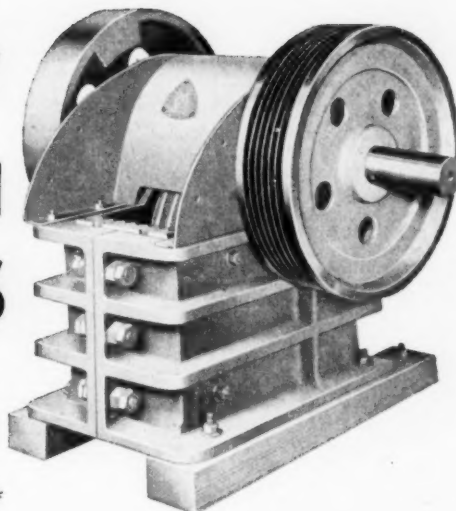


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We have in stock 12 only new 8" x 10" Denver Forced Feed Jaw Crushers. These are standard crushers and we are fortunate, indeed, to be able to ship from stock.

CAPACITY—1.3 tons per hour— $\frac{1}{2}$ " product

SHIPPING WEIGHT—2660 pounds

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SPECIFICATIONS—Heavily reinforced split frame. 13-14% Manganese Steel jaw and cheek plates. Jaw plates are reversible. Anti-friction bumper bearings. Bronze side bearings. Bearings are sealed against dust and dirt. Cast iron safety toggle. Heavy steel shaft.

OTHER SIZES—A complete line of crushers from 2 $\frac{1}{4}$ "x3 $\frac{1}{2}$ " to 21"x40". Limited number of certain size crushers are in stock in addition to the 8"x10" listed above.

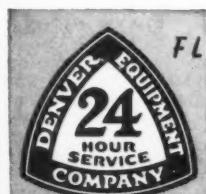
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FREE-LITERATURE PREVIEW

To get any item of free literature illustrated or described in the Production Equipment Preview, note the key number of that item, circle the corresponding number on the PEP coupon, and mail it to Mining World, 121 Second St., San Francisco 5, Calif.

ELECTRIC SHOVELS: Bucyrus-Erie Co. electric shovels, equipped with Ward-Leonard electric control, are built for heavy-duty loading. For contact information, circle 3.

DIESEL PROTECTIVE MAINTENANCE: Cummins Engine Company has released a bulletin on their recommended maintenance program for diesel owners. For a copy of Bulletin No. 12, "Protective Maintenance Increases Profits," circle 10.

REAR-DUMP EUCLIDS: A 16-page catalog covering Models 31TD and 53TD Rear-Dump Euclids of 44,000 lb. payload capacity has been published by Euclid Road Machinery Co. Circle No. 16 for Form No. 120.

MINE ROOF BOLTS: A newly published illustrated booklet describing Bethlehem Mine Roof bolts, bolt sets, plate sets, tie sets and channel sets, is now available upon request from MINING WORLD. Increased safety, more working space, increased production, faster movement and wider rooms are among the advantages gained by using Bethlehem Mine Roof bolts and accessories. Circle No. 22.

PIT MINING: A new 6-page, two-color folder released by the International Har-

vester Company describes "High Production, Low Costs . . . With International Pit and Quarry Power. Form A-317-NN is yours by circling No. 50.

CATERPILLAR MAINTENANCE: "Look to Your Caterpillar Dealer for Dependable Service," is the title of a 12-page booklet issued by Caterpillar Tractor Co., featuring proper machinery maintenance. For booklet 30171 circle No. 37.

CYLINDERS: Ledeen Mfg. Co., Los Angeles, Calif., manufactures compact cylinders for operation of chute gates, cherry pickers, and for numerous other push-or-pull applications in the mineral industry. Designed for air, water, or oil operation, available for medium, special, and super duties in a wide variety of sizes. Ledeen cylinders and the mountings to adapt them to special uses are described in Bulletin 500. Circle 42.

EXCAVATORS: Bulletin No. 403, just released by the Marion Power Shovel Company, is a 32-page, 2-color booklet which shows working views and gives condensed specifications for the entire line of Marion equipment: shovels, draglines, clamshells, cranes, backhoes, pile drivers, and coal loaders. Circle 58.

BLASTING CAPS: For complete information concerning Du Pont "MS" delay blasting caps in 14 clearly marked delay periods from 25 to 500 milliseconds, circle No. 61.

CONVEYOR BELT IDLERS: Catalog No. 785, published by Jeffrey Manufacturing Co., gives complete information on varied line of belt idlers, self-aligning, pivoted-type return, and many others. For your copy of this informative work, circle PEP No. 70.

SHOVELS, DRAGLINES: For information on Thew Shovel Company's line of

shovels, cranes, draglines, clamshells, and hoes, in a variety of sizes and models that will perform virtually any loading job, circle 67 on the PEP postcard.

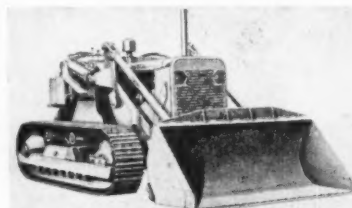
AUTOMATIC CAR COUPLER: The Willison automatic car coupler, manufactured by National Malleable Steel Castings Co., couples two haulage cars on contact, uncouples simply from a safe position, and eliminates slack between cars. For further information, circle No. 68.

HORIZONTAL AUGER DRILL: Drilling horizontal holes 4, 6, or 8" in diameter, the McCarthy self-propelled drill often drills 1000 to 1500' per day in shale, sandrock, and soft limestone. For a complete story on Salem Tool Co.'s McCarthy drills and a list of users, circle 94.

DIAMOND DRILLS: For complete information on Christensen Diamond Products Co.'s line of core bits, concave bits, and reaming shells in all standard diamond-drill sizes, circle 95.

Shovel-Mounted Tractors Available In Four Models

A complete line of shovel-mounted tractors, with standard bucket capacities up to four yards (light material buckets up to seven yards) is now available in all four models of Allis-Chalmers crawler



tractors according to Tractomotive Corporation, Deerfield, Illinois and Allis-Chalmers Manufacturing Company, Milwaukee 1, Wisconsin.

The new, larger sized Tracto-Shovel units, designated as Models HD-9G, HD-15G and HD-20G, are similar in design to the popular, 1-yard-capacity HD-5G. Multi-utility machines, the new line of Tracto-Shovels can be maneuvered in confined areas and are easily transported from one job to another.

Varying in capacity, to match the weight and horsepower of each tractor, the HD-9G mounts a 2-yard bucket and dumps at a maximum height of 11 feet 4½ inches. The HD-15G employs a 3-yard bucket and has a dumping height of 12 feet 8 inches while the huge HD-20G, torque-converter-driven tractor, uses a 4-yard bucket dumping at a height of 13 feet 5 inches.

Further information on the new Tracto-Shovel models can be obtained by circling 79.

PEP Editor

MINING WORLD-WORLD MINING

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Please send me complete and free information on the following equipment described in your PEP section, and keyed by the numbers I have circled:

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CIRCLE	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
NUMBERS	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
YOU	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
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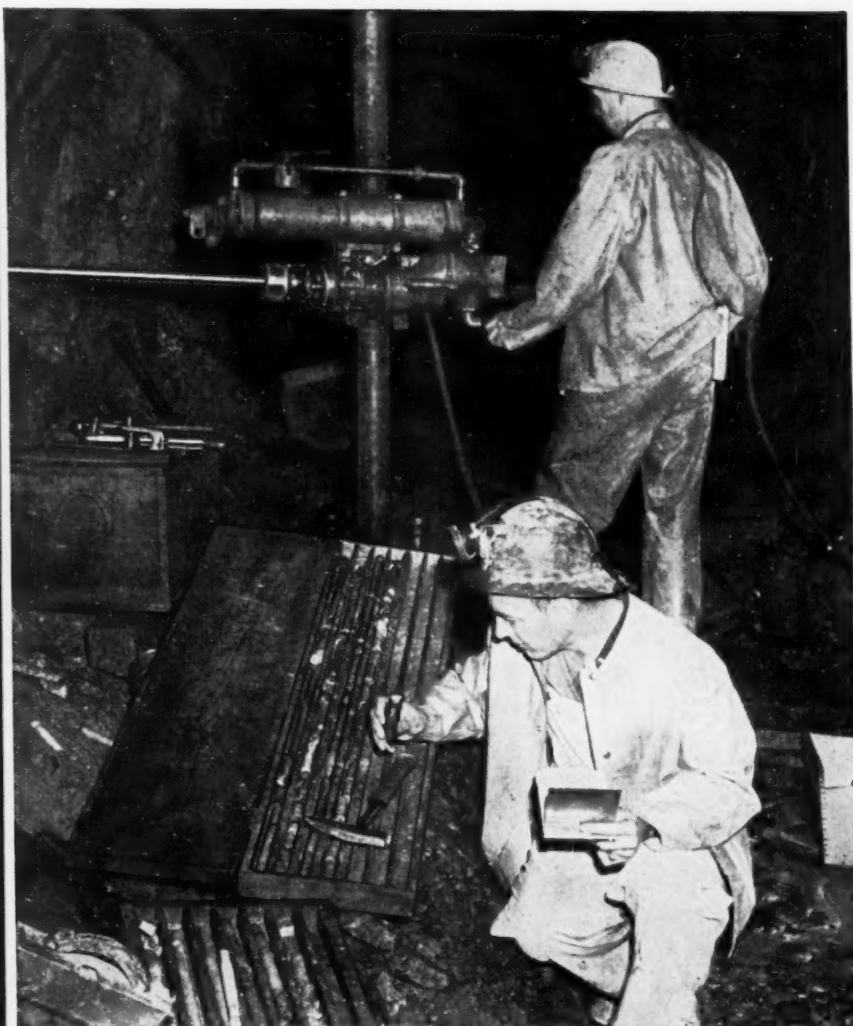
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Core drilling at a large western property.

With its high capacity—500 feet with E Rods and EX Fittings—its self-aligning rod puller for holes deeper than 100 feet . . . and a delicacy of bit control that gives low bit cost and high core recovery . . . the CP-55 Diamond Drill is unequaled for locating new ore bodies or extensions of existing ones.

Designed around the CP Rotary Air Motor—the fastest, most powerful rotary motor on a diamond drill, the CP-55 is recognized for its high drilling speed, light weight and low maintenance. It is equally efficient for blast hole drilling.

For the larger holes, or difficult drilling conditions requiring high torque with relatively slow spindle speed, the CP-55A is recommended.

Write for Bulletin 318-2



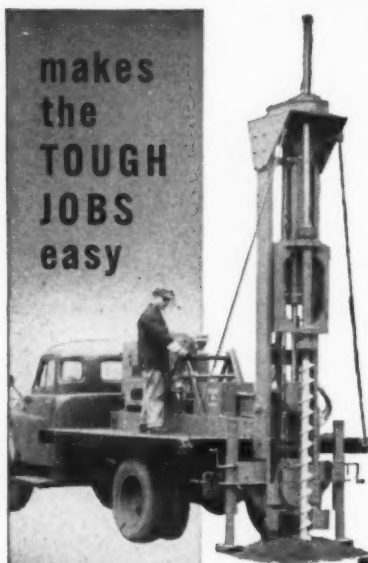
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OCTOBER, 1951

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McCarthy **MOBILE-MOUNT** **VERTICAL DRILL** **FOR BLAST HOLE DRILLING**

McCarthy Vertical Drills are compactly designed for truck, half-track or caterpillar mounting. They adapt to any job where soft rock formations are to be removed, and their tough, simplified construction means bigger profits through reduced drilling costs and increased drilling speeds.

McCarthy Drills are equipped with plenty of power and finger-tip controls. They're easy to set up and easy to move about.

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Domestic Iron

Continued from Page 19

planned capacity; and some bottlenecks already existed. The expanded facilities will permit continued operation at the higher tonnage.

SOUTH IS STABLE

Everything in the so-called Southeastern area, insofar as iron and steel are concerned, can best be described as stable—that is, growing in a healthful, balanced manner. The section anticipates an increase of 1,500,000 tons of ingot capacity between 1950 and the beginning of 1953, and production of iron ore should just about keep abreast of the requirement.

In 1950 the area produced 7,640,000 tons of furnace feed. Most of it was a beneficiated product of the brown ores of Alabama and Georgia. A slightly higher production would have been possible had it been required.

A number of small producers in the Alabama-Georgia field have already increased output, and extensive exploration and development there should raise production somewhat. Presently operating mines can be expected, as usual, to step up activity a little if the requirement is present. Imports of ore from South America also are expected.

Sheffield Steel Corporation will, however, provide one of the largest increases. Operating mines in the North and South basin areas of Texas, the company has laid plans for increasing production to 1,000,000 tons annually by the beginning of 1953. Output has been ranging at the 350,000-ton mark.

The Lone Star Steel Company is expanding iron ore output at its open pit mines in north eastern Texas to produce ore for the company's expanding steel plant. The ore is beneficiated before shipment. In 1950 a total of 2,215,599 tons of ore was mined to produce 552,272 tons of concentrate. Plans for 1953 call for the shipment of 850,000 tons of concentrate from 3,000,000 tons of ore.

Ozark Mining Company, M. A. Hanna, operating agent, has already taken steps at its Iron Mountain, Missouri, operation to provide the second largest increase—100,000 tons each year.

Ozark's mine has been operated for some time as an openpit. As the pit deepened and development of underground mining was indicated, the company launched the program to expand the normal 200,000-ton

annual production during the transition period. The size of the jig plant was increased, and the mine was opened to employ small Diesel shovels and truck-haulage underground. The result is a reversal from the usual. Instead of production declining with the abandonment of the pit, a thoroughly modern underground operation has increased tonnage by 50 percent.

EXPANSION IN EAST

Eight companies produce iron ore in New York, New Jersey, and Pennsylvania. They operate 16 mines, six open pits, 10 underground mines, and 10 beneficiation plants. Three orebodies are being newly developed by underground methods, and one pit is nearing exhaustion. All ore is magnetite, ranging from 22 to 45 percent magnetic iron, and magnetic concentration followed by sintering is common practice. A small amount of non-magnetic iron is recovered by flotation, an experimental pelletizing plant is in operation and a large mill, employing Humphreys Spiral Concentrators, is being built to treat martite—a non-magnetic iron mineral.

The biggest builder of all eastern operators is Jones and Laughlin Ore Company with a 300,000-ton-per-year expansion program at its Benson Mines near Star Lake, New York. Its plant to treat martite and a new sintering plant to handle the concentrate are now under construction. In addition, all bottlenecks are being removed from the present ore handling system to provide for further expansion of 500,000-ton-per-year capacity that is to be constructed about 1954.

Jones and Laughlin Ore Company mines from two rather large and one small open pit. Both large pits (Newton Falls and Benson) contain substantial reserves of martite in addition to the magnetite presently being milled. Martite is a term locally used to refer to the non-magnetic iron mineral. The magnetic and non-magnetic ores form a continuous gradation; however the two types are relatively well localized in defined zones and can be mined separately. Hence, it has been possible to mine the magnetite separately; but eventually it would be necessary to move large quantities of the martite to recover all of the magnetite. Having facilities for milling both ores will simplify the mining procedure in both pits and increase the available reserves.

Pit run ore has been averaging 22.5 percent magnetic iron and less

MINING WORLD

than 3.0 percent non-magnetic. Martite recovery is not a matter of diverting a tailing from one treating circuit to another; but rather, the mining and milling of an entirely new product. In addition to the increased production capacity, the new facilities will permit improved pit operations and will avoid the removal of materials which could not be processed in the plant.

The new mill will consist of three stages of gravity concentration in spirals. There will be 80 five-turn spirals in the rougher state and 40 in each of the two cleaning states. Liberation can be accomplished at a grind of minus-14-mesh. From a feed averaging about 22 percent iron, a 60 to 61 percent concentrate will be produced. Mill construction should be completed by the year's end, and the new sinter plant is expected to be in operation by March 1952.

New Pennsylvania Mine

Sinking of the first of two vertical shafts by Bethlehem Cornwall Steel Corporation (Frazier-Davis Construction Company, contractor) near Morgantown, Pennsylvania, has been started. When full production is attained, Bethlehem probably will be the largest iron producer in the east. The new mine is about 30 miles from

Cornwall, site of the company's present operations.

Located originally by the use of airborne magnetometer, the property was test-drilled on 600-foot centers. Preliminary findings indicate an inclined orebody with about 3,000 feet of strike length lying between 1,500 and 3,000 feet of depth. The ore is magnetite and is expected to run about 40 percent iron. A magnetic concentrator and pelletizing plant will be built to produce a furnace feed with plus-60-percent iron content. Some production from development of upper levels may be expected as early as 1953. Full production will probably not be reached before 1955. Total estimated cost: \$34,000,000.

The company's openpit mine at Cornwall, which has produced intermittently since Revolutionary War days, will be exhausted this year. Development of ore horizons below the pit level has been started from the No. 3 shaft, and this should replace the 2,500-tons-per-day that have been coming from the pit. No. 4 shaft, a 3,000-foot-long incline, opens a rather large orebody where concreted haulage and slusher drifts are being used. A substantial life span, at 4,000 to 4,500 tons of crude production daily, should be expected.

Bethlehem operates one of the finest concentrating plants in the iron industry at Lebanon, Pennsylvania. Magnetic separators recover most of the iron. Tailing flows to flotation circuits where copper (chalcopyrite), pyrite and substantially all of the remaining magnetite are recovered.

Adirondack Production

At Tahawus, New York, National Lead Company produces about 2,200 tons of magnetite concentrate daily as a co-product of ilmenite. The concentrate will average 59 percent iron and 10 percent TiO_2 . All present production is being shipped. Part of it is sintered at Tahawus before shipment to eastern blast furnaces. The balance is shipped as concentrate to operations with excess sintering capacity. National Lead has good reserves, the market for ilmenite (the principal product) is excellent; this operation should be a dependable producer for years.

Republic Steel Corporation, with its two operations at Mineville and Lyon Mountain, New York, has stabilized production at about 1,250,000 tons of concentrate annually. The figure should remain nearly constant for years, and no expansions are presently contemplated. By the addition of several hundred

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underground miners, to nearly double the 1,400 tons per day output of the Fisher Hill operation would be possible without any plant expansion, but, because of labor supply, housing and certain economic factors, would be quite impractical.

Richard Ore Company, Wharton, New Jersey, is contemplating no increases in output; but it has nearly finished a complete rehabilitation of its concentrating plant. Current monthly output is 9,000 tons of 65 to 67 percent concentrates, 2,500 tons of lump ore for open-hearth-furnace feed and 3,500 tons of crushed ore for blast-furnace feed. Both lump and crushed ore average 60 percent iron, and all weights are in net

(short) tons.

Alan Wood Steel Company is developing at deeper levels in order to maintain production at its Scrub Oaks mine near Dover, New Jersey. The inclined shaft is being sunk to a depth of 3,840 feet to open the 7th and 8th levels, and a new double drum hoist with 1,750-hp. motor is being installed. Ore assaying about 30 percent iron is concentrated by magnetic separation and tabling. Capacity is about 640,000 tons of crude annually—250,000 of concentrate averaging 67 percent iron. The company's Washington mine at Oxford is a rather new development. Grade of ore is higher (about 40 percent iron), sulphur content is

higher and the concentrate averages about 56 percent iron. Capacity at the Washington is about half that at Scrub Oaks and is expected to continue at the present rate—perhaps slightly more as mine development progresses.

Warren Foundry and Pipe Corporation, operating the Mt. Hope mine near Wharton, New Jersey, could use additional underground miners to bring production up to mill capacity. With a fine, large, magnetic concentrator and excellent equipment both on the surface and underground giving an annual capacity of 500,000 tons of crude, output in 1950 was only 325,000—175,000 tons of shipping products.

Ringwood Iron Mines, Inc. is reopening the Peters and Cannon mines in Passaic County, New Jersey. Plans call for the addition of milling equipment and construction of a pelletizing furnace. A small tonnage will be produced in 1951, 100,000 tons of 68 percent iron concentrate is scheduled for 1952 and 250,000 tons in 1953.

WEST WILL GROW

Western steel and western iron ore production will remain in balance. The west has substantial reserves of good grade iron ore. Some of it however requires a long rail haul to the steel plants. Geographical factors make the west an exporter of iron ore, mostly to Japan. Regular shipments are being made from mines in Nevada, California and British Columbia.

The Kaiser Steel Corporation has an expansion program underway at its Eagle Mountain, California mine which will insure adequacy of iron ore for its Fontana steel plant during the immediate future. The 1950 production of 830,731 tons is to be increased to 1,205,000 in 1951 and to 1,371,000 in 1952 in line with steel capacity expansions.

Colorado Fuel & Iron Corporation seems to be self-sufficient with its large underground mine at Sunrise, Wyoming, supplying half its needs and most of the rest coming from southern Utah. It also obtains manganese-iron ore from Boston Hill, Grant County, New Mexico. No new mine expansion plans have been announced.

Geneva Steel Corporation along with the blast furnace operation at Provo, Utah obtains all of its ore from the Columbia Iron Mining Company near Cedar City, Utah. The expansions in this company's requirements are being met with normal pit expansions at Iron Mountain.

When Minutes Count...



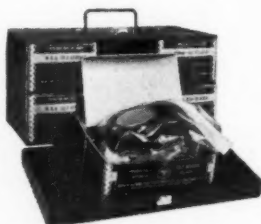
depend on the **M.S.A.** **Self-Rescuer** Instant breathing protection for underground emergencies

When deadly after-damp is produced by fire or explosion, the miner's *immediate need* is breathing protection against carbon monoxide. The M.S.A. Self-Rescuer is an approved, dependable safety item that provides the precious minutes of emergency respiratory protection to the miner while traveling from a contaminated area into fresh air. Compact and light in weight, the Rescuer contains a

chemical cartridge, hermetically sealed against deterioration. This cartridge is replaceable after use, a feature that makes the Rescuer an economical device for training purposes. The flexible rubber mouthpiece is shaped for a comfortable, natural fit in the mouth and forms a perfect seal in combination with the newly designed nose clip to assure inhalation through the Rescuer only. U. S. Bureau of Mines Approved. Write for Bulletin No. BC-1.

For convenient underground storage

The M.S.A. Cache Assembly, consisting of 6 Self-Rescuers complete in a sturdy metal case, permits convenient underground storage throughout the mine. The Assemblies are designed for storage in various locations—working sections, along conveyor belt line, on man-trip cars—for instant application in emergencies. Individual carrying cases also available.



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Minnesota Sells Mining Rights on 87 Properties

The Minnesota State Executive Council has awarded permits to 14 mining firms and individuals to prospect for iron ore on 87 state-owned parcels of land on the Minnesota iron ranges. About 150 bids were received. The sale was the biggest in state history with the highest prices in the bidding. Seventy-seven of the properties are undeveloped, according to Ray Nolan, director of the State Lands and Minerals Division, and only 11 of the units contain a known tonnage of iron ore.

The Cleveland Cliffs Iron Company received the largest number of permits with 22. The Oliver Iron Mining Company was second with 14 permits. The W. S. Moore Company received 12 parcels, including a 20,000-ton stockpile of lowgrade ore at the Syracuse mine near Riverton. The Haley-Young Mining Company received nine parcels, one of which is the Mississippi No. 1 near Keewatin, with an estimated 320,000 tons. If this tonnage should be mined, the state would receive \$752,000 in royalty payments.

Next in the list was Skubie Brothers of Virginia with seven permits. Charles H. Remer and E. A. Young, Inc. of Hibbing each received five permits. Inter-Range Mining Company and Rhude and Fryberger were awarded three permits each; one of the latter's is the Mississippi No. 2 with an estimated 1,904,000 tons of which there are 1,524,000 tons of underground wash ore, 360,000 tons of underground merchant ore and 20,000 tons of openpit wash ore. The average royalty bid on this tonnage was about \$1.63 per ton.

The remaining parcels went to R. Maturi Corporation of Chisholm, two; Zontelli Brothers, Inc. of Ironton, two; Pacific Isle Mining Company of Hibbing, one; Oscar Nelson, Virginia, one; and Junior Mining Company, Virginia, one.

Central-Eastern Firms Get DPA Tax Write-Offs

The Defense Production Administration approved the following certificates of necessity for accelerated tax amortization for expenditures being made by numerous central and eastern companies:

The Universal Exploration Company applied for fast amortization on \$1,200,000, was eligible on \$1,037,000 with a 60 percent certification. The company plans installation of facilities to recover zinc concentrate with the location listed by DPA as Jefferson County, Tennessee.

The American Zinc Company of Tennessee's application listed \$272,846 of which \$267,846 was eligible and 60 percent was certified. This company also plans to install zinc-concentrating facilities at Friends Station, Tennessee. The Eagle-Pitcher Company plans to spend \$288,500 on equipment to produce zinc oxide at Galena, Kansas. The entire

amount was eligible with a 60 percent certification.

The St. Joseph Lead Company plans to install machinery for lead production in St. Francois County, Missouri, and the application listing \$784,760 was approved, 60 percent certified. The company also made application for \$2,967,200 of which \$2,478,898 was eligible and 60 percent certified, and will add to its Herculeum, Missouri, facilities for the production of lead, zinc and cadmium. A third application for \$1,079,650 of which \$833,150 was eligible and certified at 60 percent covers zinc-refining equipment for the Balmat, New York, plant.

In Nebraska, the American Smelting & Refining Company was eligible for tax amortization on 60 percent of \$52,000 to provide facilities for debismuthizing the complete bullion intake of the Omaha lead refinery in order to provide additional bismuth for the defense effort. The company also was eligible for 60 percent on \$108,000 to provide a vacuum dezincing installation which will have a sufficient capacity to vacuum dezinc approximately 90,000 tons of lead bullion per annum.

The Aluminum Ore Company was eligible to write off 70 percent of \$523,000 to be spent on an aluminum plant at East St. Louis, Illinois, while the Jones

& Laughlin Ore Company in New York was allowed a rapid amortization on 85 percent of \$2,951,000 for expansion of iron mining at the Benson mine.



The Oliver Iron Mining Company is preparing to extend its already large Mountain Iron openpit mine in Minnesota by doing further stripping on the north side of the pit.

The W. S. Moore Company is shipping ore from its newly opened Judson mine pit near Buhl, Minnesota. The mine contains an estimated tonnage of 256,823 tons. H. E. Reese is general manager.

Pickands Mather & Company's taconite concentration plant at Aurora, Minnesota, is in steady operation and is producing from 500 to 600 tons of concentrate pellets daily. The results to date have been very satisfactory, both as to the plant itself and furnace use of its product.

Currently under construction for the Pittsburgh Steamship Company are three new iron ore carriers which will be named for three directors of the United States Steel Corporation. The vessels will be named the Philip R. Clarke, Arthur M. Anderson, and Cason J. Callaway. Mr. Clarke is chairman of the City National Bank and Trust Company of Chicago; Mr. Anderson is chairman of the executive committee of J. P. Morgan & Company Incorporated, New York; and Mr. Callaway is a leading experimental farmer in the South and owner and operator of Blue Springs Farm of Harrison county, Georgia. The three 647-foot carriers, which are scheduled for completion toward the end of the year, will add 2,200,000 tons a year to the iron ore carrying capacity of the U. S. Steel subsidiary's 61-vessel fleet.

The Calumet & Hecla Consolidated Copper Company is carrying on further exploratory drilling in the neighborhood of its now-producing zinc mine at Shullsburg, Wisconsin. The company's research department has moved its various activities to new quarters in a building which was modernized for its use at Calumet, Michigan. George L. Craig is director of research for the company.

The Alcoa Mining Company applied to the DPA for accelerated amortization on \$376,226 and was granted permission to write off 80 percent of the investment at the accelerated rate. The company is doubling power plant capacity, re-opening the Good Hope vein, flooded since 1920, and is installing pumps. The mine, a fluorspar property, is at Rosiclare, Illinois.

The Hanna Coal & Ore Corporation is doing exploratory diamond drilling in



DISCOVER SULPHUR DEPOSIT

This drilling rig sunk one of the wells which proved the existence of a large sulphur deposit, Garden Island Bay, at the mouth of the Mississippi River. Freeport Sulphur Company will spend \$10,000,000 to \$15,000,000 to build a plant with the objective of producing 500,000 long tons of sulphur per year and operation is to begin in 1953. Freeport obtained the sulphur rights from The Texas Company, which will receive 50 percent of the profits derived from the operation.

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Becker County, which is in western Minnesota, west of Duluth with Detroit Lakes as the county seat. The locations selected for exploration were among those which aerial surveys by magnetometer last year indicated as likely sites for further examination. No drilling has been done in this unexplored area, which is covered by from 190 to 300 feet of glacial drift.



Central and Eastern states receiving DMA grants from the government recently include the following. In Arkansas, J. Ashley and Joe Gold received \$12,685 of a proposed expenditure of \$16,913 on antimony exploration in Sevier county. In Michigan, the Calumet & Hecla Consolidated Copper Company received \$284,097 of \$568,193 to be spent on copper exploration in the Houghton and Keweenaw regions. The Vermont Copper Company in Vermont received a grant of \$25,691 of \$51,382 to be spent for diamond drilling to the north of present workings at its Orange county copper property.

Aluminum Ore Company plans new production facilities at its Mobile, Alabama plant which, together with a new alumina works at Bauxite, Arkansas, and an expansion at East St. Louis, Illinois, will increase alumina production 180,000 tons annually. Production from Mobile is expected by late 1952.

The *Bethlehem Steel Company* has begun sinking a shaft on its Morgantown, Pennsylvania property to start development of what will be known as the *Grace* mine. About 30 months of work will be necessary before magnetite ore will be mined from the property. The shaft may be sunk as deep as 2,500 feet, will be about 21 feet in diameter and will contain three skipways, two to raise ore. Power lines have been installed and clearing and leveling of the site is being completed. About \$34,343,000 will be spent on the entire project, to be managed by Bethlehem's subsidiary company, *Bethlehem Cornwall Corporation*. As many as 1,250 men may be employed when full production is reached.

The conservation of mica is being urged by government officials in order to make more available for stockpiling. The grade of Indian mica which had long been preferred in this country for its uniformity and high quality is now deteriorating. Mica in the United States is not uniform and would require processing before it could be used.

Lone Star Cement Corporation, New York, has opened a new plant at Roanoke, Virginia. The plant is a modern wet-process unit. A similar one in size and type will be opened in the near future at Sweetwater, Texas.

The *Diamond Magnesium Company* poured the first magnesium ingots in the reactivated government plant at Painesville, Ohio, in July, after a six-year shut-down of those facilities. In 1942, the government spent \$16,000,000 to build the 18,000-tons-per-year plant, which was closed at war's end. Capacity will be reached again at the end of this year. Diamond Magnesium ran the plant for the government in the 1940's also.

OCTOBER, 1951

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precipitates—SOUTHWEST

Nevada Titanium Plant To Raise World Output

The first large-scale, self-contained titanium plant will be constructed by Titanium Metals Corporation at Henderson, Nevada. Production of the metal is expected to increase world production eight-fold.

The company, jointly owned by National Lead Company and Allegheny Ludlum Steel Corporation, has obtained leases on major components of the big Basic Magnesium Inc. plant built by the government during World War II.

A certificate of necessity covering \$14,162,840 of the initial installations has been awarded by the government and the company has been assured the proper priorities for obtaining process equipment. The government has contracted for metal production of 3,600 tons of titanium metal per year and operations are expected to meet this level by late 1952. Included in these operations is the production of titanium sponge and the melting of titanium metal into ingots.

An annual power supply of 151,000,000 kilowatt hours from the Hoover and Davis Dams has been allocated by the Colorado River Commission.

Government Grants More Funds & Tax Write-Offs

DMA grants and DPA accelerated tax amortizations continue to be announced, with the following companies in the southwest region benefiting: In Arizona, the American Asbestos Cement Corporation received \$111,482 from DMA (see item below under Arizona). United Mine Operators, Inc., Box 836, Wickenburg, was eligible for fast tax amortization through DPA on 75 percent of \$76,000 to be spent at the Unida mine for further mining and milling of copper ore. In California, the Black Rock Mining Corporation received \$46,218 from DMA for its \$61,624 program of development and mining of tungsten deposits near Bishop, Mono County. Sierra Copper Company received 50 percent of the \$16,613 it plans to spend on copper development in Calaveras County.

In Nevada, the Nevada-Massachusetts Company was eligible for accelerated tax amortization on 60 percent of \$125,000 to be spent on its tungsten mine and mill at Tungsten. Basic Refractories, Inc. at Gabbs and Luning will get exemptions on part of a \$2,126,400 project.

In Texas, a DMA grant of \$56,925 was allowed the Paulsel Mining Company which plans to spend \$75,900 for mercury exploration in Brewster County. And \$7,838 was granted to the Maravillas Minerals Company for a \$10,450 mercury exploration project in the same county. The Armco Steel Corporation was eligible for fast amortization on 85 percent of \$1,500,000 to be spent for iron ore production at Rusk.



The American Asbestos Cement Corporation has been authorized to receive a government loan for exploration of asbestos deposits in Gila County, about 12 miles southeast of Young, Arizona. The total cost of the project is given as \$123,869, of which the government will supply 90 percent or \$111,482. In addition to mapping and geological studies, about 18,000 feet of drilling will be authorized under the federal grant. American Asbestos holds about 100 mining claims, covering 2,000 acres. The company is completing the erection of a mill at a cost of \$75,000. The plant, which will process five tons of fiber per day, is scheduled for completion within the next three months. Amon R. Smith of York, Pennsylvania, is president of the company. George Kohl, Globe, Arizona, is superintendent.

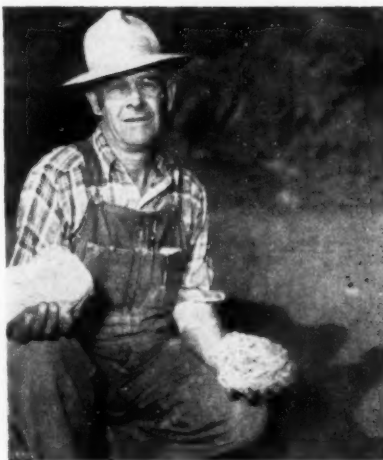
A strike of high-grade ore has been reported at the French Lily mine of Cedar Talisman Consolidated Mining company, near Cleator, Arizona. The ore, containing gold, copper, lead and zinc, was encountered in the East Drift 359 feet in from the portal and has been followed for almost 350 feet. Where crosscut, the vein is 40 feet wide. The company proposes to sink its 400-foot shaft an additional 200 feet to get beneath the recent discovery and prove it at depth. It will

be further explored by about 1,000 feet of diamond drilling. The company is headed by J. Walters, Jr., Phoenix. R. P. McLeod, Cleator, is mine superintendent.

The Pima Rock and Sand, Ajo Way, Tucson, Arizona, has made an initial shipment of three carloads of copper ore from the Loudon mine to American Smelting and Refining Company at Hayden. The ore is said to have carried 3 percent copper, 45 percent silica and 18 percent lime. The Loudon mine, owned by the Lewisohn Estates, is located 14 miles east of Sahuarita, with a good road into the property. The initial work has been done by a three-man crew working with scraper from a drift into the mountain. Driving of a tunnel to determine the extent of the ore body is being speeded up with the employment of a night shift. The company hopes to expand production to 1,000 tons monthly. D. K. Lieberman is president and Louis Green is engineer for Pima Rock and Sand.

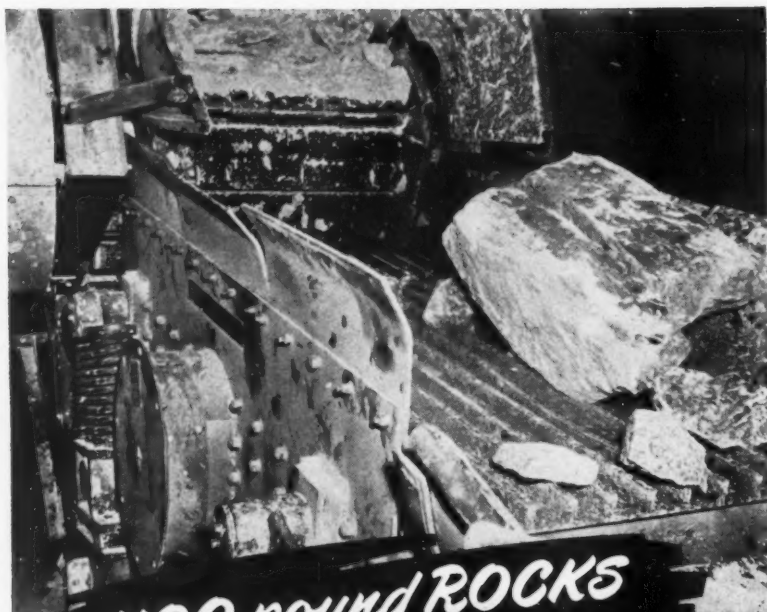
Dye and Bathrick, Box 1069, Kingman, Arizona, have started work at the Boriata tungsten mine, 15 miles northeast of Yucca, Arizona, employing a crew of 10 men. They are operating a small concentrating mill, handling ore from lessees on the company property, retreating old mill tailings and mine dumps, as well as accepting small lots of custom ore. It is reported that a concentrate running 68 percent is being obtained from ore running 2.5 to 3.0 percent tungsten.

About 50 tons of copper and zinc ore are being mined daily at the Copper World mine, 15 miles northeast of Yucca, Arizona, operated by Mountain States



DOZER STRIPS CINNABAR LEDGE

Stripping is under way at the Culver Baer mine, 16 miles east of Cloverdale, Sonoma County, California, in preparation for further openpit mining of cinnabar ore. Some mining is now in progress both from shaft and openpit operations, and ore is being roasted in the rotary furnace on the property. Recovery is from 30 to 35 pounds of mercury per ton, according to reports. In the picture on the left is L. A. Hulbert, part owner of the Culver Baer. On the right, a Caterpillar Diesel D7 tractor strips overburden from a ledge of silica-carbonate carrying cinnabar.



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Metals Company. A 75-ton milling plant was recently completed and is being run two shifts daily. The connection between the adit tunnel and shaft has been made and the company expects to be able to increase production as soon as stopes are prepared. George A. Freeman, Yucca, is president and general manager, employing a crew of 24 men.

The *Sutton-Daysdale Mining Company*, headed by Wayne Sutton, Box 35, Willcox, Arizona, has started working the *Sutton* mine with a crew of 10 men. Initial production, at from 30 to 60 tons daily, will be increased to 150 tons when a full crew of 50 men is obtained. Shipments will be made to the El Paso copper smelter of AS&R. The *Sutton* mine is located about 16 miles southwest of Bowie, Arizona, and consists of 26 unpatented claims. During leveling operations for camp construction, 70,000 tons of rock were removed. The high-line aerial tramway from the shaft near the top of the mountain is 7,100 feet long and has a capacity of 18 tons per hour. Ore values are in gold, copper and lead.

Hans Sanderson, Box 1614, Prescott, Arizona, has made a few small shipments from development work at the *Evergreen* mine in the Hassayampa mining district. He is leasing this lead-zinc-gold silver property from Roma Tomlinson and is prospecting and developing the claim through an adit and winze.

From two to three tons of tungsten ore are being mined daily from surface operations on several veins at the *Bull Canyon* tungsten mine, 16 miles east of Yucca, Arizona. Six men are employed in the operation by Dalton Robinett, Box 501, Kingman, owner of the property. Robinett hopes to be able to mill the ore at the *Boriana* mill which is being reconditioned by Dye and Bathrick, owners of the *Boriana*.

J. C. Howard, Jr., Tucson, Arizona, is leasing the *Ben Lomond* mine, a group of 18 claims in the Papago mining district of Pima County. He is driving a tunnel on a lead-silver vein, employing a crew of four men.



The first manganese concentrating plant in Trinity county, California, reportedly will be erected near Hayfork by *McLaughlin Corporation* of Texas which controls a large manganese deposit 15 miles from the town.

Stock rights have been issued by the *Central Eureka Mining Company* to finance expansion of the company's gold mine at Sutter Creek, California. The company hopes to increase production from 150 tons to 300 tons of ore daily. Either the main shaft or the 3,500-foot-level winze of the old Eureka shaft will be sunk to the 4,800 foot level. Ore shoots in the Central Eureka shaft will also be developed by drifts at the 4,150 foot level and at the 4,800 foot level of the old Eureka mine. Through these improvements, the company hopes to recover 36,013 ounces of gold annually, valued at \$1,260,441.

The *Security Mining Company*, said to be incorporated for \$1,500,000, is re-opening the *Boss* mine near North San Juan, Nevada county, California. Idle for almost 20 years, the mine contains showings of zinc, silver, lead, and copper ore.

MINING WORLD

The *Rising Hope* gold mine near Placerville, California is reportedly being reactivated by Pike and Leroy D. Pettersson of San Bernardino. Future plans include installation of a mill capable of handling 500 tons daily. A large copper deposit has also been found on the property.

Further activity in the tungsten field is as follows. About \$300,000 has been spent by *Tungsten Associates, Ltd.* on the *Crane-Hess* mine in the Saddlebag Lakes area of California. Shipments of scheelite have begun and construction of a mill and concentrator is planned shortly. A series of parallel veins have been discovered and the lode has been exposed for several miles. Harry Epstein is president and general manager. *Billington Mining & Milling Company* is said to be operating a 100-ton mill in Mojave, while its unit in Randsburg is turning out 16 tons daily. Apparently extensive deposits have been leased by James T. Scott for a reported \$200,000.

Shipments of copper ore are being made from the *Donner* mine in Calaveras county, California to *American Smelting & Refining Company's* plant at Tacoma, Washington. The mine is 25 miles southeast of *Penn* mine at Campo Seco. A two-compartment shaft 100 feet deep is reportedly sunk on a vein 16 feet wide. The operation is backed by Ronnie B. Smith of Dallas, Texas, who has leased the Mountain King mill near Hodson. He expects to operate it on ore from the Donner mine. Roy G. Mead is in charge of operations and Howard Castle is mine foreman.

Chrome producers in Del Norte county, California, are reported planning to establish an independent stockpile station at Crescent City. Northern Califor-

nia producers have been urging the establishment of another stockpile because transportation to the lone station at Grants Pass, Oregon, is too costly. Foss Launch & Tug Co. will build bunkers and provide loading facilities.

L. W. Loomis has leased his *Nigger Hill* placer mine east of Placerville, California, to William Milbrandt of Oregon. Milbrandt plans to develop a virgin section of the mine by extending the existing tunnel.

The *Columbia Steel Company*, subsidiary of the *United States Steel Corporation*, has established a Tramway Division with headquarters at 141 Battery Street, San Francisco, California. The Division is equipped to provide equipment and designs for tramways of numerous varieties both in the U.S. and abroad.



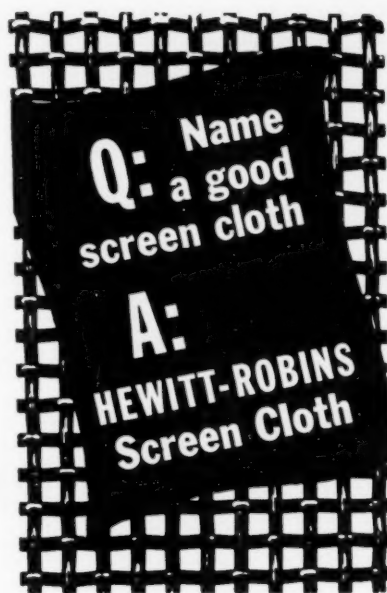
A shipment of 23 carloads of ore has been consigned to *Kennecott Copper Corporation's* smelter at McGill, Nevada, from the new *Wedge* test pit. Located close to the *Kimbley* pit which the company is currently stripping, the *Wedge* area originally was to be used for dumping waste material. Then it was decided to experiment with the small body of ore located there to see if it could be used as smelter flux or milled and smelted in the same manner as other *Kennecott* ores. If it can be done profitably, the *Wedge* ore will be mined and the resulting pit will then be used to dump waste material from the *Kimbley*. *Kennecott* is also reported to have purchased a portion of the *Minnesota* and *Butcher Boy* mining claims in Ruth, Nevada, from the *Consolidated Copper-mines Corporation* for approximately \$350,000.

Back Rock Desert Mineral Company is reported planning production of sulphur from its deposits near the Western Pacific Railroad, 60 miles north of Lovelock, Nevada. Construction of a plant capable of handling 250 tons daily is also scheduled.

Iron King Adventurers has given a lease on its property in the Cortez Range near Beowawe, Nevada, to *The Utah Construction Company*, principal independent producer of iron ore in the western United States. Future plans for this property will be contingent upon the results of the exploration.

Twenty-eight mine cars of tungsten ore are ready for shipment from the *T-Bone* mine near Austin, Nevada. The property, owned by *Marsam Enterprises, Inc.*, consists of 120 acres of lode claims and 80 acres of placer claims, with water rights. A crosscut is said to show a 4-foot vein, with a 15-inch vein alongside it, and a 2-foot vein 7 feet away, all running parallel.

Production at the *Copper Canyon* mine near Battle Mountain, Nevada, is being carried on from the 700-, 500-, 300-, and 200-foot levels, as compared with previous operations which were confined to the 700-foot level, according to Robert H. Raring, vice president and general manager of *Copper Canyon Mining Company*. An estimated 300 tons daily will be produced, rather than the 200-ton daily average in 1949. As soon as custom milling begins, mill production will be about 400 tons daily.



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MINING WORLD

The Winnemucca Mountain Mines Company at Winnemucca, Nevada, now converting its pilot mill to a 50-ton mill, also will add a table concentrator, a flotation unit, and a jig. The company expects to treat tungsten, as well as gold and silver, having recently acquired six tungsten claims in Rye Patch district. Included is the Star group where a cross-cut tunnel was recently driven 200 feet underground, opening a vein of tungsten ore. Eighteen other claims have also been added to the company's property, bringing the total to 55 gold-silver claims for the organization.

Industrial Mines Corporation has leased a group of claims from Dick Sheehy of Yerington, Nevada, and Bill Strand of Fallon, Nevada. The property is between Gabbs and Rawhide.

Nevada Scheelite, Inc., a subsidiary of Kennametal, Inc. of Latrobe, Pennsylvania, is enlarging its mill near Rawhide, Nevada without interrupting production.

E. S. Babcock of Hawthorne, Nevada, is developing a tungsten mine a few miles south of the town. The property consists of the Flying Cloud and several adjoining claims. Besides the development work, Babcock is having a two-mile road built to the site.

Mark Young of Pocatello, Idaho, has started shaft sinking at the silver-lead property he recently leased from Pete Fabbri of Tonopah, Nevada. The mine is 19 miles west of Tonopah in the Lone Mountain mining district and has been an intermittent producer for some years.

Standard Slag Company is shipping 25,000 tons of ore per month from its openpit mines in the Gabbs area. The company loads ore on the railroad at Luning for shipment out of San Francisco for Japan.

NEW MEXICO

Laguna Indians are reported to have found a uranium ore (apparently carnotite) on their reservation, halfway between Grants—site of the first major find in New Mexico—and Albuquerque. The discovery appears to be an extension of the Grants uranium field. It has touched off speculation that the total field may extend 100 to 120 miles in length and 80 miles in width. It has also been revealed that representatives of the U.S. Atomic Energy Commission have inspected the area but there has been no report on their findings. Chairman Gordon Dean of the AEC inspected the area after announcing that he would look over what he described as "a low-grade uranium ore bed."

Heim and French, under the management of William Heim, shipped the first carload of bastnasite produced in the United States from their mill at Galinas, New Mexico, to Lindsey Light and Chemical Company, West Chicago, Illinois, which is operated under license of the U.S. Atomic Energy Commission. The ore came from the Red Cloud mine, formerly a fluorspar producer.

Preparations are being made to open the Tom Payne mine in the Cerrillos mining district, 25 miles southwest of Santa Fe, New Mexico, according to reports. The lead-zinc producer was closed down about five years ago. Owner William Maghee is said to have started two new

drifts and is preparing machinery and other equipment for production. Reports also say he may lease the property. In the same area, Verne Byrnes is readying his Pennsylvania lead-zinc mine for production.

The Copper Hill Mining Company has given up attempts at production from its Mirabal copper property near Grants, New Mexico. Tries at shipping ore to the American Smelting and Refining Company smelter at El Paso, Texas, for ore and flux are said to have indicated that the operation would be unprofitable.

The Scor-Blox-Lite-Wate Aggregate Company continues scoria production in the San Antonio Mountains in northern New Mexico. Work begun about a year ago is being done by the Folsom Cinder Company of Englewood, Colorado. The

firm is owned by A. C. McMillon.

The office of the New Mexico Miners and Prospectors Association formerly at 200 West Central Avenue in Albuquerque, has been moved to more modern quarters at 310 South Third Street. However, despite the address change, the association still receives mail at P.O. Box 503, Albuquerque.

The town of Santa Rita in southwestern New Mexico is moving from its perch atop an "island" of copper that is to be mined in the defense effort. The moving plans, extending over a decade or so, call for the relocation of 37 homes, affecting about a tenth of Santa Rita's 1,800 population. The move is being made by the Kennecott Copper Corporation and the Isbell Construction Company, working in stripping operations there.



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Uranium Found in Lake County, Colorado

The discovery of torbernite occurrences in the Leadville area, Lake County, Colorado has been announced by Secretary of the Interior Oscar Chapman, who said the finds were of importance because uranium has not heretofore been found in that area. A discovery of uranium also has been made in Park County.

The torbernite was located at a small prospect in the St. Kevin mining district, eight miles west of Leadville. The uranium occurrence was found in a mine dump in the Alma district, Park County, and was said to assay one percent uranium. The U. S. Geological Survey made the discoveries while conducting a mine study for the Atomic Energy Commission. Although not enough ore was found for commercial production, the area doubtless, will be thoroughly checked now for better possibilities.

Filtrol Plans \$50,000 Pyrite Flotation Unit

The Filtrol Corporation will install a \$50,000 flotation unit at its plant at 1710 S. Redwood Road, Salt Lake City, Utah, for the removal of pyrite or FeS_2 from halloysite clays. The company also has signed a contract with the New Park Mining Company for halloysite clays from its Park City mines.

In the new unit, to be designed and

constructed by the Galigher Company, clays leave the washing thickener, are pumped up an incline and run through the flotation rougher which takes out most of the pyrite concentrates; the tailing of purified clay returns to the existing circuit. The pyrite concentrates then are sent to two additional cleaners for further extraction of clay (which is returned in each case to the main circuit) and finally go out of the plant to a stockpile. The clay is processed into an agent for catalytic cracking of crude oil.

The contract with New Park involves exploration and development by the latter of the upper levels, particularly, of the New Park mine off the Park-Bingham tunnel. The halloysite deposits there have never been diamond drilled or blocked out. Filtrol has been getting most of its clays from the Eureka mine at Tintic, Juab County, of the Dragon Consolidated Mines Company (about 6,000 tons monthly). Many lead-zinc-silver mines in the area have showings of halloysite and are potential sources of supply for Filtrol.



The Empire Zinc Company is reported to be diamond drilling on the Middlesex Mining Company and H. F. Hartwell properties, the latter including the Monte Cristo mine, in Hoosier Pass out-

side of Breckenridge, Summit County, Colorado. Empire, which has been leasing, is now taking up its option on the properties. The Monte Cristo has been worked sporadically since the war by John C. Kennedy and contains lead, zinc, gold and silver ores.

Rail and pipe supplies, a Caterpillar tractor and other mining equipment is being acquired by the U. S. Oil and Development Corporation at Silverton, Colorado. The company is starting an extensive exploration project at the Lark mine through the help of a DMA loan.

The United Mining & Leasing Corporation has received \$10,000 from DMA for a \$20,000 lead-zinc exploration project in Gilpin County, Colorado.

The old Moro-Ajax near Lake City, Colorado, idle since 1908, is being reopened by the Collins Western Corporation, with Glenville A. Collins, mining engineer of Santa Barbara, California, directing operations. The Moro-Ajax is developed by three tunnels, the lower of which has been rehabilitated. A winze being sunk off this tunnel is further developing a vein of lead, zinc, copper and gold ore. The building of a mill is contemplated.

The United States Lead Corporation is preparing ground for driving a new lower tunnel at the Superior mine, Montezuma, Colorado, owned by C. L. Martin. Hugh Chisholm is superintending.

Shaft sinking has been started at the General Teller mine at Montezuma, Colorado, under the direction of Kenyon Iron Works of Denver. A 5,000-gallon oil tank, pipe and other supplies have been moved to the property.

Increased production is planned by W. L. Davenport, Harold Horn and Marvin Murger at the Wellington and Minnie lead-zinc mines, Breckenridge, Colorado. New electrical equipment and machinery has been installed at the Wellington, and plans are being considered for the sinking of a shaft there to develop at depth veins mined off cross-cut in the main Mule tunnel. Off the tunnel a vein with surprisingly high gold values was found recently in the Prize Box vein system. The Minnie mine is being developed slowly and its ore has been concentrated off and on during the year in the leased Country Boy mill. Rumors that the Country Boy mine and the adjacent Sallie Barber mine may be opened by other operators have been heard.

The General Investment Corporation of Los Angeles, California, and Salt Lake City, Utah, has a crew of geologists in the uranium-vanadium districts of Mesa County, Colorado, mapping and staking claims. To date 20 claims have been staked in the West Gateway district. In this same district, A. J. Guthrie and Associates of Dallas, Texas, have had a development program under way for several months. The group has staked 98 claims and has a number of them under development. The Guthrie associates are also mining uranium in the Henry Mountain area of Utah.

The ground has been broken for a new mill in Montezuma, Colorado, being built by Fred Brooks and his partner,

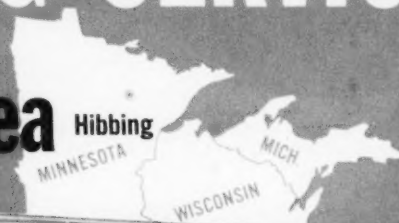


ANACONDA LEAD BUYS COLORADO MINES

The Anaconda Lead and Silver Company recently acquired a controlling interest in the Gold Empire Inc. gold properties, in center foreground above, and bought the El Paso mine, in the background, at Cripple Creek, Colorado. The two properties will be operated jointly. Both the new Carlton mill, less than a mile away, and the completion of the Carlton Drainage Tunnel should enhance the earnings of the mines. The Tunnel has dewatered the area to a depth of about 1,300 feet below the El Paso 11th level.

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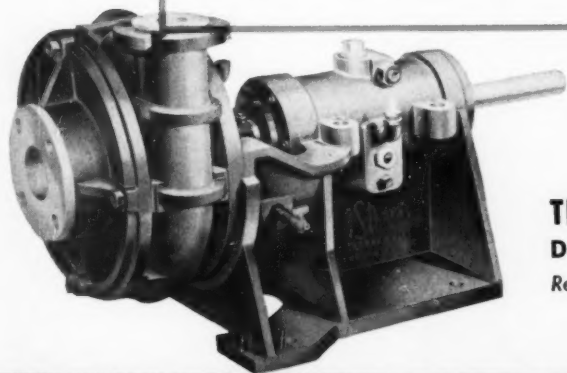
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CENTRIFUGAL PUMPS

Herbert T. Young. Their firm, *Brooks and Young*, runs the *Allen Emery* mine and about 100 tons of lead, zinc and silver ore is shipped weekly to Leadville. The partners recently announced the discovery of another good vein in the mine.



The *J. R. Simplot Company* of Salt Lake City, Utah, and Boise, Idaho, controls 1,100 uranium claims covering about 30 square miles in the Temple Mountain mining district of Wayne and Garfield Counties, Utah. On these claims, according to J. R. Simplot, diamond drilling has shown ore occurrences for a length of four or five miles. Miners are working on two headings in the main development in Hatch Canyon, and roads are being built into Happy Canyon, both near Hanksville. The company expects to be able to ship daily to the *Vitro Chemical Company* mill in Salt Lake City when full operations start.

The U. S. Atomic Energy Commission has had withdrawn from mineral entry about 66 square miles in Grand County, Utah and will do comprehensive study and testing by diamond drilling on the land. The total area now withdrawn for Commission work amounts to 264 square miles in southwestern Colorado and southeastern Utah. Private holdings are not affected.

Fifty uranium-bearing claims have been leased by the *Vanadium Corporation of America* from A. A. Hunt and Sons of Hanksville, Wayne County, Utah, according to reports. The claims are near the Green and Colorado rivers' junction in Poison Springs Canyon, Wayne and Garfield counties. J. W. Fetzer, Vanadium's geologist, said that the area warranted development.

The *New Park Mining Company* has made a geochemical survey of about 500 acres of its mining claims in the Park City, Utah, mining district, under the direction of Ray E. Gilbert, chief engineer and geologist.

Park Utah Consolidated Mines Company's \$45,000 exploration project, assisted by DMA by a grant of \$22,500, will provide for a 300-foot extension of a south crosscut and 900 feet of drifting from this crosscut on the 1500 Ontario or drain tunnel level. The company is installing transformers, power equipment, and material for operations at the portal of the Star Tunnel and after this tunnel is re-timbered to operating condition, the drift on the Naildriver fissure will be extended to the projected downward extension of the old Naildriver ore shoot.



The *Continental Sulphur and Phosphate Corporation* of Dallas, Texas, has started exploratory drilling, trenching, road building, sampling and mapping of its *Sunlight Basin* sulphur deposits in Park County, Wyoming. Fumarolic sulphur deposits are found in brecciated igneous rocks on the company's claims.

MINING WORLD

precipitates — NORTHWEST

Sunset Minerals Explores Liberal King Vein

Sunset Minerals, Inc., producing 100 tons of lead-zinc-silver ore daily from the Sunset vein in the Pine creek district of north Idaho's Coeur d'Alene mining region, has obtained DMA approval of a \$53,725 lead-zinc exploration project. The money will be spent exploring the old Liberal King vein, partly explored by the predecessor Liberal King Mining Company, according to Bliss Moore of Kellogg, Idaho, vice president and general manager.

Following surface bulldozing, 6,000 feet of diamond drilling will be projected downward and 2,000 feet from old underground workings in search of ore shoots. A 360-foot raise will be driven from the Liberal King 600-foot level. The 900-foot No. 2 Liberal King tunnel will be rehabilitated and 600 feet of tunnel driven to get under a surface ore showing. Three lessees already are mining lead-zinc-silver ore from the Liberal King vein in the adjoining Idaho group of claims which Sunset Minerals recently purchased from Proctor-Knott Company.

Bunker-Chance Planning Deep Development

Plans to sink a 1,100-foot shaft and to drive 3,200 feet of cross-cut and drifts have been reported by the Bunker-Chance Mining Company, which owns a silver-lead property at Wardner, Idaho. The company has applied to the Defense Minerals Administration for about \$236,000 and expects to put up matching funds of its own for the work, according to T. L. Hume of Portland, Oregon, president.

The property has been under sporadic development since the 1920's and a 2,000-foot working crosscut to the Alhambra Fault plus considerable drifting footage from that point now exist, as well as an old shaft about 450 feet deep and a long crosscut off it to the Butler vein system.

American Zinc To Drill Metaline Property

American Zinc, Lead and Smelting company is diamond drilling its previously unexplored holdings adjoining the Grandview mine in the Metaline district of Pend Oreille county, Wash. Work started in mid-August as a \$120,000 zinc-lead exploration project, with 50 percent of the funds contributed by DMA. The entire sum will be spent diamond drilling, according to Dale I. Hayes, the firm's western manager. About 20,000 feet of holes are planned. Four crews operated two diamond drills on a two-shift basis initially but Hayes said work may be pushed on a three-shift basis later.

The firm has held mineral rights 10 years on the ground adjoining Grand-

view, which it operates under a 50-50 profit-sharing agreement.



Rhode Island Mining Company will diamond drill its four-claim property on Terror gulch in the Evolution mining district, Shoshone county, Idaho, under a \$25,000 DMA lead-zinc exploration project approved recently. All drilling will be from the surface, the company announced. James Zanetti, Wallace, is president and secretary.

Idaho-Custer Mines, Inc., recently began operation of its new 200-ton mill about three months after start of construction, according to President Harry P. Pearson of Wallace. The mill operates on an estimated 60,000 tons of dump ore at the once-famed Livingston lead-zinc mine near Mackay, Idaho. Meanwhile, underground workings are being prepared for mining a large tonnage of mill feed blocked in recent years by lessees who made only crude ore shipments. The mill feed lies above the 2,200 main adit. Plans also call for reopening the 2,400 level and sinking a 500-foot shaft. John B. White Jr., former chief engineer for the Galigher company of Salt Lake City, will act as Idaho-Custer's general superintendent.

Metropolitan Mines Corporation, adjoining the Sunshine mine in north Idaho's Coeur d'Alene mining region, has purchased for stock the Destroyer group of 11 unpatented mining claims adjoining its holdings on the south. Sunshine Mining Company's long 3,100 level crosscut into Metropolitan ground is nearing Metropolitan's southern boundary, and acquisition of these new claims assures that the Sunshine crosscut will be extended to the vein. The Metropolitan vein is the principal objective.

Silver Banner Mining Company, controlled by Coronado Copper and Zinc Company of Los Angeles, has optioned the Gem State group of 22 mining claims between Wallace and Mullan, Idaho. The claims adjoin the Gold Creek property, optioned earlier this summer by the new entry into the Coeur d'Alene mining region. Blair W. Stewart, president of Silver Banner and vice president of Coronado, said plans call for exploring the two groups as a unit. Old tunnels are being reopened and the surface trenched. A detailed geologic study also is underway.

Mullan Metals, Inc., has started exploration of the long-idle Big Four group west of Mullan, Idaho. The firm started a creek-level adit shortly after purchasing the property. Objective is a promising vein exposed in old upper workings. The intersection is expected at between 600 and 1,000 feet. Officers of the firm are also officers of Lucky Friday Silver-Lead Mines Company.

Kootenai Dike Mines, Inc., recently

organized firm with offices at Coeur d'Alene, Idaho, has acquired mineral rights and leases on 6,500 acres in the Bonners Ferry, Idaho, area. Holdings include the old Idamont Lead-Zinc mine and the Two Tails property. The company plans extensive mining development, according to Dr. Ray E. Currie, Oakland, Calif., president.

Goldstone Mining Company has resumed driving of its deep-level haulage tunnel into Goldstone mountain near Salmon, Idaho, according to B. W. Porter of Seattle, president. A Diesel-powered compressor was installed to replace a gasoline-powered compressor cracked by 40-below-zero cold last winter. A four-man crew has been making five feet daily.

Mascot Mines, Inc., is now using three shifts daily for milling operations at its Little Pittsburgh mine on Pine Creek. Mill rate is averaging about 120 tons daily compared to 70 tons during 1950. Stations and skip pockets for the new Nos. 9 and 10 levels are being cut. Crews are mining on Levels 6, 7 and 8. Inar Norgaard is mine manager, Dunham Bell is mill manager, and Claude Nugent is engineer.

Sidney Mining Company recently intersected the Sidney orebody on its new 1,100 level in the Pine Creek district of north Idaho's Coeur d'Alene mining region. Malcolm Brown, general manager, said the orebody was found farther west than anticipated but was similar in grade and character to that mined on the 900 level.

Recently incorporated in Idaho were the following companies: The Parker Mining and Milling Company, Inc., of Sandpoint, capitalized at \$100,000 and listing incorporators as O. H. Parker of Sandpoint, H. T. and Frank Parker of Barstow, California; Lucky Seven Mining Company of Wilder, \$225,000, and incorporated by Guess Huff of Wilder, Glen Pegram of Homedale and Wayne C. Davis of Caldwell; Atomic Minerals, Inc., of Boise, \$150,000 incorporated by Don Graft, C. C. Hargrove and Thomas A. O'Connell, all of Boise; Lady Drake Mining and Milling Company of Fairfield, \$50,000, and incorporated by J. W. Robinson of Rawlins, Wyoming, B. A. Draker of Kimberly and others; Springdale Silica Sand, Inc., of Kellogg, \$100,000, incorporated by Lester Harrison, Wayne A. Brainard and Wendell R. Brainard, all of Kellogg; and Kootenai Dike Mines, Inc., of Coeur d'Alene, \$625,000, incorporated by Ray E. Currie of Oakland, California, Hilbert F. Anderson of Richmond, California, and Charles G. Prell of Bonners Ferry, Idaho.

Hecla Mining Company has completed an extensive improvement program at its Burke, Idaho, surface plant, according to R. W. Neyman, general superintendent. The plant serves the Star mine, Idaho's largest zinc producer, which is owned by Sullivan Mining Company. The Sullivan firm, which also owns an electrolytic zinc plant at Silver King near Kellogg is owned jointly by Hecla and Bunker Hill & Sullivan Mining and Concentrating Company. The entire five-acre dump area has been paved. Rub-

ber-tired hydraulic lift forks unload machinery and supplies from railroad cars on the dump. Fluorescent lighting has been installed in the machine and blacksmith shops. An overhead crane has been installed in the machine shop.



Sylvan Gold Mines, Inc., has added six mining claims by purchase and location to its original group of seven claims near Basin, Jefferson county, Montana, according to Harve H. Phipps of Spokane, president. This summer the company did assessment work for 1951 and 1952, including rebuilding of one and one-half miles of washed-out road, constructing a cookhouse, overhauling min-

ing machinery and cleaning out more than 500 feet of old tunnel.

Ambassador Mines Corporation has suspended tunnel work in favor of diamond drilling at its property in Sanders county, Mont. M. J. Unger, president, said diamond drills will explore ahead of the 1,850-foot adit for the downward extension of the Wanda vein, which shows gold-silver-copper-lead at the surface. Two other veins and a fault cross-cut by the tunnel also will be diamond-drilled.

Caledonia Silver-Lead Mining Company, Kellogg, Idaho, expects to make shipments soon from its property near Lewiston, Fergus County, Montana, where stripping of overburden from the company's dickite deposit is underway.

Golden Messenger Corporation plans to sink about 200 feet at its *Crystal* mine near Basin, Montana, with aid of a recently granted \$30,938 DMA lead-zinc exploration loan, according to W. L. Bell of Spokane, the firm's consulting en-

gineer. Deepest development is 450 feet. The property was purchased in 1942 after suspension of operations at the *Golden Messenger* gold mine near Helena, Montana. Prior production is reported at 21,325 tons containing 11.3 percent zinc, 10.9 percent lead, 15.86 ounces of silver, 1.41 percent copper and 0.17 of an ounce of gold per ton.

Rob Roy Mining Company is planning to develop its *Iron Chancellor* prospect 25 miles east of Lewistown, Mont., according to Bliss Moore, Kellogg, Idaho, president. Plans call for exploring two lead-zinc-silver showings, both at the surface and underground. The firm recently started development work at its north Idaho property in the Sunset peak area north of Wallace.

The *Granite* and *Bi-Metallic* mines in the Flint Creek mining district, near Philipsburg, Montana, are being reopened by Juanita & Parry Yob. These mines produced over 32,000,000 in silver prior to 1905. Repairs are being made to the 8,850-foot *Bi-Metallic* drain tunnel which taps the *Bi-Metallic* shaft at the 1000-foot level, and the *Granite* shaft at the 1450-foot level. When the repair work is completed, the mines will produce silver, lead, zinc, and rhodochrosite manganese. The silver-lead-zinc ores will be treated in a 200-ton flotation plant located near the collar of the *Bi-Metallic* shaft, and provision has been made to increase the daily capacity of the plant to 800 tons. Work is under the direction of Parry C. Yob, son of the late Joseph C. Yob who managed the properties for the Philipsburg Mining Co., and who, together with Juanita Yob, purchased the properties in 1944.

A promising Montana tungsten deposit is being diamond-drilled south of Anaconda, near Melrose. Frank Eichelberger of Spokane, E. J. Cleveland of Reno, and E. A. Julian of San Francisco have formed the *American Alloy Metals Inc.* to work the prospect. DMA will contribute about \$42,000 of the \$55,000 to be spent on exploration.

The old *Gold Bug* mine near Utica, Montana, in Judith Basin County is being unwatered by California interests. Rolf L. Meuer of Randsburg, California, is in charge.

Recently incorporated in Montana were *Keystone Mining Company*, Helena, with a capital of \$50,000, by George A. Davis, C. B. Mitchell, and Paul T. Keller; *Montana-Arizona Mining Company*, Gallatin county, with a capital of \$100,000; and *Double Eagle Tungsten Company*, with a capital of \$50,000. Directors of Montana-Arizona Mining are James E. and Charles R. Anderson of Lewiston and Maynard Sinton of Manhattan. Directors of Double Eagle are William R. McClure, W. L. Degenhart, and E. T. Irvine, all of Philipsburg, Granite county.

Operators at *Little Anaconda* mine, Mineral county, Montana, have located, by drifting, lead and silver ore containing some zinc and copper, according to reports. The mine is within a few miles of the expanding *Nancy Lee Mines, Incorporated*.

Mountain Talc Mines' property south of Ennis, Madison county, Montana, has been taken over by *Sierra Talc & Clay Company* of Los Angeles. Montana Power Company is constructing a 21-mile long electric transmission line at Sierra's expense for mine operations. The mine is now known as the *Yellowstone* mine. The talc will be used for insulators in electronic instruments. Henry Mulryan, Los Angeles, is executive vice

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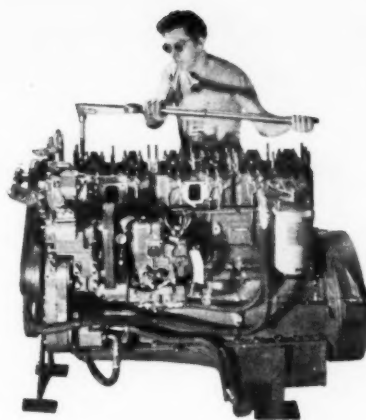
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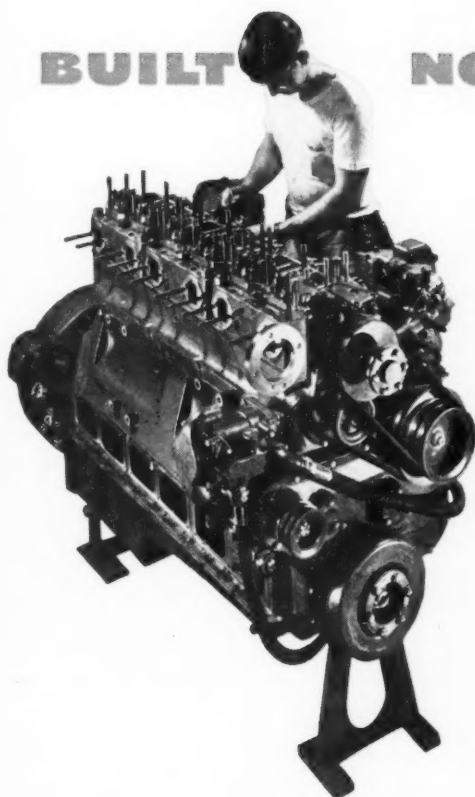
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OCTOBER, 1951

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president and general manager of the firm, which has other properties in California, New Mexico, and Nevada. E. W. Stevens of Norris, Montana, is superintendent of the Montana operations.

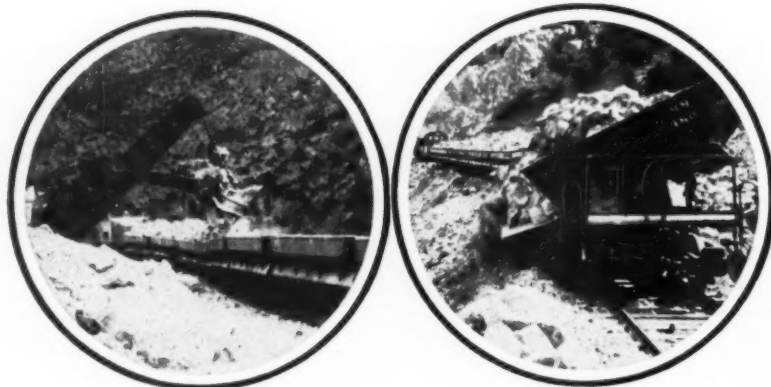


A new 100-kw, 3-phase, continuous, open-top smelting furnace has been put into service at the U.S. Bureau of Mines laboratory at Albany, Oregon. Experi-

mental work will be done on direct smelting of nickel alloys from iron-nickel ore mined near Riddle, and on other ores, including high-phosphorous iron ores from Scappoose, Oregon, and Montana chromite concentrates. Another furnace rated at a capacity of 500-kw will produce operating data upon which to base plans for industrial smelting operations. This larger furnace will be used to prove up smelting procedures already tested in the 100-kw furnace.

Two carloads of copper ore from the John Hamlin mine have been shipped from Grants Pass, Oregon, to the Tacoma, Washington, smelter. The mine is on Onion Mountain, 30 miles west of Grants Pass and is run by the Strategic Minerals Corporation, Ltd., of Medford.

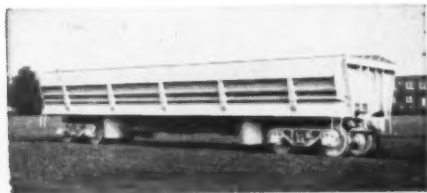
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Clugston Creek Mining Company of Spokane has purchased the old Chloride Queen mine northeast of Colville, Washington, from Colville Queen Mining Company. The property, consisting of 420 acres of deeded ground, adjoins the Clugston Creek Company's Big Chief group of claims. Thomas Le Page, Spokane, president, said plans call for early diamond drilling and tunneling under a promising mineralized outcrop. The Chloride Queen in early days yielded a little silver-bearing ore but production was mostly iron ore which went to an iron works in Colville. R. D. Baker, Redmond, Ore., is president of Colville Queen Mining Company.

The Goldfield Consolidated Mines Company, will explore its Sierra Zinc mine in northern Stevens county, Washington, under the \$23,054 joint DMA-company contract, T. (Cy) Higginbotham, resident manager, announced. Funds will be expended diamond drilling and driving a 300-foot exploration raise to the surface. The former producer as been idle several years. The company's 300-ton daily production is coming from its Deep Creek mine and Anderson open-pit mine in the same district.

Cascade Gold Mining and Milling Company of Spokane recently was incorporated in Washington state to develop the old Durrwachter property at the head of Kechess lake in Kittitas county. Attorney Harve H. Phipps, one of the incorporators, said they have started cleaning out tunnels at the copper-gold property located in 1912 and idle the last 10 years.

Pacific Mutual Silver-Lead Company is planning a diamond drilling program at its property near Keller, Ferry county, Washington, according to Manager C. A. Gray of Spokane. The firm has improved its mine plant and water system to permit winter operations and has retimbered the mine shaft.

The Northwest Mining Association has changed the dates of its 1951 Spokane convention from December 14-15 to November 30-December 1. Sessions again will be at the Davenport hotel. General Chairman Frank Marr has named Howard P. Sherman and Harold Kirkemo, Spokane mining engineers, to work with Lew Grant of Wallace, Idaho, chairman of Columbia section, American Institute of Mining and Metallurgical Engineers, in arranging technical sessions.

American Zinc, Lead and Smelting Company has accelerated work at its Lead Hill property in the Slate Creek area of northeastern Washington's Metaline mining district with the object of getting into early production. Ore is to be trucked to the company's Grandview mill near Metaline Falls. The company did extensive exploration work last year and installed an air compressor and other equipment this spring.

A new drill which can bore a 6½-inch hole 17 feet into solid rock in an hour is being used by the Northwest Magnesite Company at its quarry operations, Chewelah, Washington. The new drill has an electric rotary tricone bit (like oil-field bits), is mounted on tracks, is comparable in size to a two and a half yard shovel and is used for primary blasting operations.

Transport Bottleneck

continued from page 27

An analysis in 1942 indicated that notwithstanding the large variety of grades, they could have handled an additional 3,000,000 to 4,000,000 tons that year.

Great Northern's trackage on the Range has been increased to expedite assembling and handling of ore. Three additional tracks have been provided at the Allouez yard and connected to yard trackage taken over from the Northwestern Coal Railway. These facilities are adjacent to the ore yard, which materially improves handling of the interline ore. The Allouez yard is two miles from the docks. Steaming facilities have been expanded so that 360 cars can be steamed simultaneously while an additional 360 cars are placed on spot ready to steam as soon as steamlines are released from other cars. Ore cars are being equipped with threaded nipples enabling tight connection of steam hose. Authority has also been given for installing gantries on docks No. 1 and No. 2 for handling the car shakers, which have been secured, and this will expedite release of cars. To expedite communication re-

garding ore grade, train reports, etc., the railroad has now installed 24-hour messenger service between the vehicle, ore docks, the yard and the scale office. This service will be continued or supplanted with a pneumatic tube for expeditious communications handling.

The Great Northern has placed orders for 700 additional ore cars; Deisel-engine operation at Allouez is anticipated. There will be sufficient supply of locomotive power for all purposes.

CUYUNA RAIL SHIPMENTS

The Northern Pacific and Soo Line railroads serve the Cuyuna Range and the tonnage is handled through the Northern Pacific's modern dock at Superior with a capacity of 108,500 tons. In 1942 this dock handled 2,810,926 tons, 3.05 percent of the total; in 1949 2,899,422 or 4.17 percent of total; in 1950 2,784,750 or 3.56 percent of total and to July 1, 1951 1,106,621 or 3.45 percent of total.

Dock tonnages handled by the Northern Pacific, Great Northern, and DM&IR, do not correspond with rail tonnages as there are various transfers between the railroads for

continued on page 113

TABLE NO. 7

Roster of New Lake Vessels Delivered 1951 and on Order for United States and Canadian Fleets

Fleet	Length		Estimated Capacity 24' Draft	Probable Year In Commission
	Overall	Beam		
American Bulk Freighters				
Pittsburgh SS Co.*	646'11"	70'	18,500	1952
Pittsburgh SS Co.*	646'11"	70'	18,500	1952
Pittsburgh SS Co.*	646'11"	70'	18,500	1952
Columbia Transp. Co.**	647'	70'	18,500	1952
Columbia Transp. Co.**	647'	70'	18,500	1952
Interlake SS Co. (Hull 298)†	646'11"	70'	18,500	1952
Cleveland Cliffs Iron Co.††	647'	70'	18,500	1952
Pioneer Steamship Co.	639' 6"	67'	18,000	1952
National Steel Corp. (M. A. Hanna)†††	690'	70'	19,500	1952
Ford Motor Co.	647'	70'	18,500	1953
Cleveland Cliffs Iron Co. ¹	620' 3"	62'	11,500	1951
Bethlehem Steel Co. ²	626'	70'	18,000	1952
Bethlehem Steel Co. ³	626'	70'	18,000	1952
Great Lakes SS Co.	643'6"	67'	18,000	1952
Interlake SS Co. ⁴	626'	70'	18,000	1952
Nicholson Universal SS Co. ^{2,5}			15,000	1951
Nicholson Universal SS Co. ^{4,5}			15,000	1951
Nicholson Universal SS Co. ^{2,5}			15,000	1951
American Self-Unloaders				
Bradley Transp. Co.	663' 3"	72'	19,000	1952
American SS Co.	627'	72'	18,000	1953
Canadian Bulk Freighters				
Colonial SS Ltd. "Scott Misener" ⁶	654'	68'	18,800	1951
Colonial SS Ltd. ⁷	654'	68'	18,800	1952
Canada SS Lines Ltd.	640'	67'	18,000	1952
Upper Lakes & St. Lawrence Transp. Co., Ltd.	664'	67'	18,000	1952
Upper Lakes & St. Lawrence Transp. Co., Ltd.	664'	67'	18,000	1952
The Marinsin and Michigon S.S. Co. has purchased and is converting the C-4 Ships "Marine Arrow," "Marine Fiddler" and "Marine Star" for Great Lakes service.				

The Wisconsin and Michigan S.S. Co. has purchased and is converting the C-4 Ships "Marine Arrow," "Marine Fiddler" and "Marine Star" for Great Lakes service.

* U. S. Steel Corp. Subsidiary.

** Oglebay Norton & Co.

† Pickands, Mather & Co.

†† S. S. Edward B. Greene.

††† Largest Vessel Ever Built for Great Lakes.

¹ Reconstructed "SS Notre Dame Victory." Now the "Cliffs Victory." First ore cargo loaded at Marquette, Michigan in June 1951.

² From Ocean. Delivery through Mississippi River and Chicago canal.

³ Reconstructed C-4 "Louis McH. Howe" U. S. Maritime Commission Vessel Christened "Toma M. Girdler" August 15, 1951. Scheduled for ore cargo October 1951.

⁴ Reconstructed C-4 "Scott E. Land" ore cargo scheduled for November 1951.

⁵ Reconstructed C-4 "Mt. Manfield."

⁶ Scheduled for some ore cargoes.

⁷ Reported longer. Exact dimensions not released.

OCTOBER, 1951

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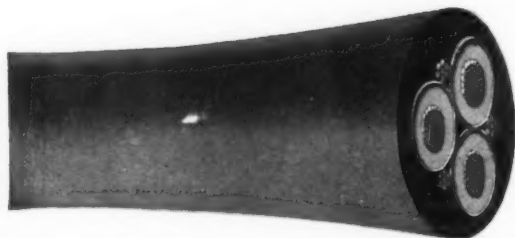
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METAL AND MINERAL MARKETS

METALS

September 20

COPPER:	Electrolytic. Delivered F.o.b. cars, destination U.S.A.	24.50¢
	Lake. Delivered, destinations U.S.A.	24.625¢
	Foreign Copper. New York	27.50¢
LEAD:	Common Grade. New York	17.00¢
ZINC:	Prime Western. East St. Louis	17.50¢
ALUMINUM:	Primary 30 pound Ingots (99% plus). F.o.b. shipping points	19.00¢
ANTIMONY:	Bradley Mining Co.'s Elk Brand 99.5%. F.o.b. Cascade, Idaho	50.00¢
	Lone Star Brand. F.o.b. Laredo, in bulk	42.50¢
COBALT:	97-99%, Keg of 550 pounds	\$2.10
MAGNESIUM:	Ingots (99.8%). F.o.b. Freeport, Texas	24.50¢
MERCURY:	Flasks. Large lots, New York	\$205.00
NICKEL:	"F" Ingots (5 pounds). F.o.b. refinery, Port Colborne, Ontario	56.50¢
TIN:	Grade A Brands. New York	103.00¢
TITANIUM:	(98.5%). F.o.b. Beverly, Massachusetts	\$7.00
GOLD:	United States Treasury price	\$35.00 per ounce
SILVER:	Newly mined domestic. United States Treasury price	90 1/2¢ per ounce
	Foreign. Handy & Harman	90.16¢ per ounce
PLATINUM:	\$90.00-\$93.00 per ounce

ORES AND CONCENTRATES

BERYLLIUM ORE:	10 to 12% BeO. F.o.b. mine, Colorado	\$35.00 per unit
CHROME ORE:	F.o.b. railroad cars eastern seaports. Long tons dry weight.	
	African (Rhodesian). 48% Cr ₂ O ₃ . 3 to 1 chrome-iron ratio	\$42.00-\$43.00
	African (Transvaal). 48% Cr ₂ O ₃ . Turkish. 48% Cr ₂ O ₃ . 3 to 1 chrome-iron ratio	\$34.00-\$35.00 \$50.00-\$51.00
IRON ORE:	Lake Superior. Per gross ton Lower Lake Ports.	
	Mesabi, Non Bessemer, 51.5% Fe	\$ 8.30
	Mesabi, Bessemer, 51.5% Fe	\$ 8.45
	Old Range, Non Bessemer	\$ 8.55
	Old Range, Bessemer	\$ 8.70
MANGANESE ORE:	Metallurgical grade. 45 to 46% Mn. Long ton unit	\$1.05 to \$1.15
	Chemical grade. 80% MnO ₂ . Per ton	\$60.00
	Chemical grade, domestic, 70% MnO ₂ , F.o.b. mines	\$45.00
MOLYBDENUM CONCENTRATE:	90% MoS ₂ . F.o.b. Climax, Colorado. Per pound of contained molybdenum.	\$ 1.00
TUNGSTEN CONCENTRATE:	60% WO ₃ . Per short ton unit	\$65.00
URANIUM ORE:	Carnotite-Roscoelite. F.o.b. purchase depot plus \$0.06 per ton mile (maximum of \$6.00), Rifle, Naturita, Uravan and Durango, Colorado; Salt Lake City and Monticello, Utah. Base price for 0.10% ore is \$1.50 per pound and ranges to \$3.50 per pound of contained U ₃ O ₈ plus \$0.75 per pound for each pound in excess of four pounds per short dry ton and an extra allowance of \$0.25 per pound for each pound in excess of 10 pounds. A development allowance of \$0.50 per pound is paid for all ores purchased.	
VANADIUM ORE:	Carnotite-Roscoelite. V ₂ O ₅ content, up to 10 pounds, in uranium ore paid for at \$0.31 per pound in ratio of 10 parts V ₂ O ₅ to 1 part U ₃ O ₈ .	

NON-METALLIC MINERALS

BENTONITE:	Minus-200-mesh. F.o.b. Wyoming points. Per ton in carload lots	\$12.50
	Oil Well grade. Packed in 100 pound paper bags	\$14.00
FLUORSPAR:	Metallurgical grade. 70% effective CaF ₂ content per short ton F.o.b. Illinois-Kentucky mines	\$43.00
	Ceramic grade. Minimum CaF ₂ content, 95%	\$45.00
	Acid grade. 97% CaF ₂	\$50.00
PERLITE:	Crude: F.o.b. mine per short ton	\$3.00 to \$5.00
	Plaster grades. Crushed and sized. F.o.b. plants per short ton	\$7.00 to \$9.00
	Concrete grades. Crushed and sized	\$6.00 to \$8.00

Quotations on metals and certain ores through the courtesy of American Metal Market, New York, N.Y.

MINING WORLD

Transport Bottleneck

Continued from Page 109

ore mixing purposes.

Two hundred new ore cars are being built by the Northern Pacific. The Soo Line is improving cars by replacing old bodies with new. Its dock-yard capacity during the year will be increased 300 to 400 cars. Steaming facilities will be improved and expanded. The Northern Pacific anticipates being able to provide good service for such additional

tonnage as might be allocated. If boats were available, it is estimated that docks could readily handle 4,000,000 tons.

MICHIGAN SHIPMENTS

The Michigan Ranges served by C&NW, Soo Line, LS&I, and DSS&A in 1942 shipped 17,294,658 tons, or 18.78 percent; in 1949 11,982,642 or 17.23 percent; in 1950 13,982,728 tons or 17.88 percent; and to July 1, 1951 6,055,828 tons or 15.81

percent. Any large increase in tonnage is not expected to be arranged for from this territory. However 300 additional cars are being secured.



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- 1—9"x36" Cedar Rapids
- 1—13"x24" TelSmith

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- 1—1' 2" disc American filter
- 1—4' 1" disc Oliver United continuous filter
- 1—4"x6" Morse Bros. continuous drum filter
- 2—8"x12" Eimco continuous drum filter
- 1—36" Merrill triangular leaf filter press
- 1—#12 Sweetland 36 leaf filter press

CONCENTRATING TABLES

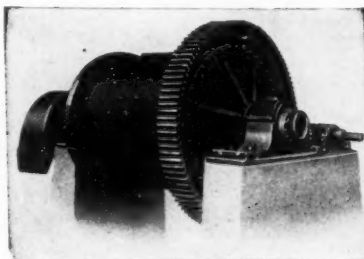
- 2—Willley #6 left hand.
- 11—Deister "Plat-O" right hand.
- 42—Deister "Plat-O" left hand.

PORTABLE COMPRESSORS

- 1—210 CFM Worthington "Blue Brute" driven by Continental gas engine.
- 2—310 CFM Gardner-Denver driven by Buda gas engines.

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- 1—1 1/2-ton Mancha type b "Little Tramer," 24" gauge
- 1—2 1/4-ton Whitcomb Battery Locomotive, 24" gauge
- 2—7-ton General Electric Battery Locomotives, 36" gauge
- 2—8-ton General Electric Battery Locomotives, 36" gauge
- 4—10-ton Atlas Battery Locomotives, 36" gauge
- 1—3-ton Ruth Gasoline Locomotive, 18" gauge
- 1—3-ton Whitcomb Gasoline Locomotive, 24" gauge
- 1—6-ton Goodman Trolley Locomotive



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- 2—6'x36" Hardinge conical ball mills
- 1—8'x22" Hardinge conical pebble mills
- 1—64 1/2" Marcy ball mill
- 1—3'x8" Marcy rod mill

COMPRESSORS

- 1—5 & 4x4" Ingersoll-Rand 50 CFM vertical
- 1—6x5" Worthington 80 CFM horizontal
- 1—6x6" Gardner—90 CFM vertical
- 1—8 1/4 & 4 1/4x5" Chicago-Pneumatic 139 CFM vertical
- 1—7 & 5 1/4x5" Gardner-Denver 156 CFM vertical
- 1—10 1/4 & 4 1/4x6" Rix 172 CFM vertical
- 1—9x8" Chicago-Pneumatic 173 CFM horizontal
- 1—12x10" Ingersoll-Rand 179 CFM horizontal
- 1—12 & 5 1/4x10" Ingersoll-Rand 293 CFM horizontal

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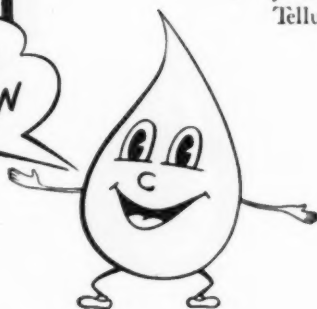
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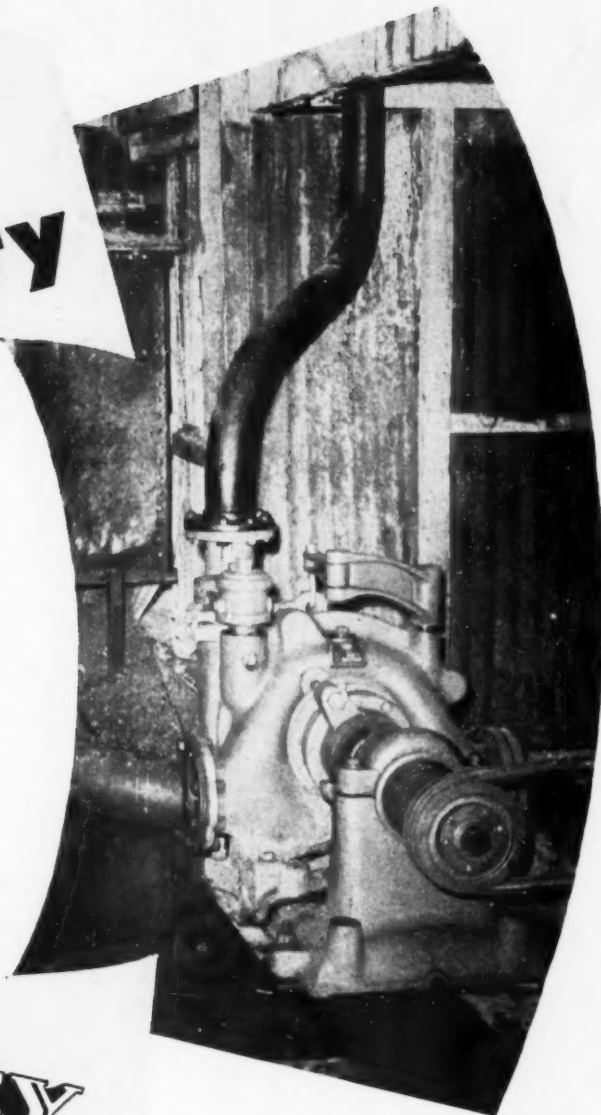
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